RRB Group D Previous Year Paper (Held on: 23 Aug 2022 Shift 3)

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

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CBT

Q1. The economic reforms were initiated by Narasimha Rao government in:

(a) the 8^(th) five-year plan
(b) the 9^(th) five-year plan
(c) the 7^(th) five-year plan
(d) the 5^(th) five-year plan

Q2. During neutralisation reaction H^+ ion comes from _____ and OH^- ion comes from ____, respectively, to form a water molecule.

(a) acid; salts
(b) base; acid
(c) acid; base
(d) salts; base

Q3. The value of the product

sin 90°. sin 89°. sin 88°. sin 87° .....sin 0° is:

(a) 0
(b) π/2
(c) 1
(d) π

Q4. 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 condition is your answer.

Number/Symbol	=	$	6	8	<	?	/	2	5	!	@	7	3	^
Code	G	L	F	M	E	N	D	P	C	R	T	B	V	A

Conditions:

(i) If the first element is a symbol and the last, a number, then the first and last elements are to be coded as @ and ¥, respectively.

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

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

How will '5 <= 2@ 6' be coded?

(a) F E G P T C
(b) B E L D T C
(c) C E G P T F
(d) F N G P T C

Q5. Find the length of the side of an equilateral triangle, if its area is 4 √3 sq. unit.

(a) 2 unit
(b) √3 unit
(c) 16 unit
(d) 4 unit

Q6. $16x^2 - 8x + 1 = 0$, then what is the value of $(16x^2+1/(4x^2))$?

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

Q7. The sign of the magnification produced by a concave mirror is:

(a) positive when the image is virtual and negative when the image is real
(b) always positive
(c) positive when the image is real and negative when the image is virtual
(d) always negative

Q8. There are four different elements along with their atomic numbers: A (9), B (11), C (19) and D (37). Find the odd element from these with respect to their positions in the periodic table?

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

Q9. Which of the following regions is known to receive the maximum rainfall from the South-west Monsoon winds in India?

(a) Western Ghats
(b) Gangetic Plains
(c) Central Plateau Region
(d) Eastern Ghats

Q10. If 18 : 30 :: 30 : x, then find the value of x.

(a) 50
(b) 40
(c) 35
(d) 45

Q11. A tank is filled in 4 hours by three pipes A, B and C. Pipe C is twice as fast as pipe B and pipe B is twice as fast as pipe A. How much time will pipe A take to fill the tank?

(a) 25 hours
(b) 28 hours
(c) 20 hours
(d) 26 hours

Q12. "Dare2eraD TB" by the Department of Biotechnology, Ministry of Science & Technology, was launched on the occasion of World TB Day by who among the following?

(a) Dr. Bharati Pravin Pawar
(b) Dr. VK Paul
(c) Dr. Jitendra Singh
(d) Dr. Mansukh Mandaviya

Q13. What is the least number added to 2488 so that it is completely divisible by 3, 4, 5 and 6?

(a) 32
(b) 34
(c) 42

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(d) 28

Q14. Which of the following statement is CORRECT about the Law of Demand with regard to subject of Economics?

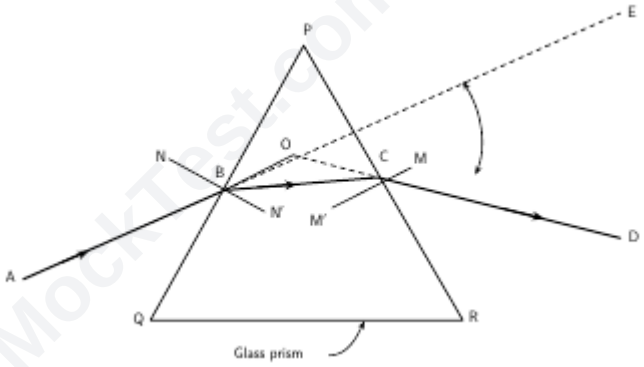
a) The law of demand is a fundamental principle of economics that states that at a higher price consumer will demand a lower quantity of a good.

b) Demand is derived from the law of diminishing marginal utility it is based on the fact that consumers use economic goods to satisfy their most urgent needs first.

c) The shape and magnitude of demand shifts in response to changes in price.

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

Q15. The figure below shows refraction of a ray of light AB through a triangular glass prism. Here, angle EOD represents:



(a) angle of incidence
(b) angle of emergence
(c) angle of refraction
(d) angle of deviation

Q16. The following question is based on the given seven, 3-digit numbers.

(Left) 347, 486, 627, 113, 721, 418, 779 (Right)

(For example, 456 : 6 = digit in unit's place, 5 = digit in ten's place, 4 = digit in hundred's place)

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

If 2 is added to the digit in hundred's place of each number given above, in how many numbers will be the modified digit in hundred's place be exactly divisible by the digit appearing in the ten's place?

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

Q17. Which of the following is an example of a thermal decomposition reaction?

(a) $2H_2O \rightarrow 2H_2 + O_2$
(b) $2NaCl\ (molten) \rightarrow 2Na + Cl_2$
(c) $ZnCO_3 \rightarrow ZnO + CO_2$
(d) $2AgCl \rightarrow 2Ag + Cl_2$

Q18. What is the greatest number, by which when 8954, 9806 and 11297 are divided, the remainder in each case is the same?

(a) 125
(b) 213
(c) 230
(d) 222

Q19. Six persons, L, M, N, O, P and Q, have cooking classes in different months of the same year, viz. February, March, June, August, September and December

P has the class immediately before Q. Only M has the class before O. L has the class immediately after N and before Q. Which of the following is correct?

(a) Q has the class in February.
(b) M has the class in March.
(c) P has the class in September.
(d) L has the class in June.

Q20. Four friends W, X, Y and Z are sitting at the corners of a square table facing towards the centre. W and Z are not at the opposite corners, but W is to the immediate right of Y. Who among the following is sitting opposite to X?

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

Q21. Simplify: $x^2 + 5x - 12 - 3(x^2 - 2x + 9)$.

(a) $2x^2 - 11x - 39$
(b) -2x2 + 11x + 39
(c) -2x2 + 11x - 39
(d) 2x2 + 11x - 39

Q22. Which Article of the Indian Constitution specifically mentions, "The official language of the Union shall be Hindi in Devanagari script?"

(a) Article 51A
(b) Article 80
(c) Article 343(1)
(d) Article 395

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

8, 18, 38, 78, 158, ?

(a) 306
(b) 324
(c) 224
(d) 318

Q24. What was the main aim of the agreement made by UNEP in 1987?

(a) To stop water pollution
(b) To use more CFCs in fire extinguishers
(c) To stop emission of greenhouse gases
(d) To freeze the production of CFCs at 1986 level

Q25. Consider the below statements and identify the correct answer.

Statement - I: Sodium hydroxide is prepared by chlor-alkali process.

Statement - II: Sodium hydroxide is used for making artificial textile fibres (such as rayon).

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

Q26. Name the app released by the Indian Army for an in-house messaging application for the military sector.

(a) MY IAF
(b) DGNCC
(c) SAI
(d) ASIGMA

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Q27. Consider the below statements and identify the correct answer.

Statement I: Series of compounds in which the same functional group substitutes for hydrogen in a carbon chain is called a homologous series

Statement II: As the molecular mass increases in any homologous series, a gradation in physical properties is seen.

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

Q28. If $x + 1/x = 4$, then $x^2 + 1/(x^2) =$

(a) 14
(b) 16
(c) 12
(d) 18

Q29. If 2^(3k - 5) = 4096, then the value of k is:

(a) 7
(b) 17/3
(c) 11
(d) 16/3

Q30. If '+' means '-', '-' means '÷', '÷' means '×' and '×' means '+', what will come in place of the question mark (?) in the following equation?

64 + 32 - 8 × 11 ÷ 3 = ?

(a) 39
(b) 93
(c) 90
(d) 35

Q31. The following table shows the number of sofa sets sold by four salespersons in three different months. Study the table and answer the question.

salespersons	May	June	July
Vishal	125	110	95
Arunima	140	92	75
Kartik	188	114	80
Mitali	125	120	210

What is the percentage contribution of Vishal's May sale in the total sale of May?

(a) 23.4%
(b) 25.6%
(c) 18.5%
(d) 21.6%

Q32. Which of the following devices is based on the principle of electromagnetic induction?

(a) Electric motor
(b) Electric fan
(c) Electric bulb
(d) Electric generator

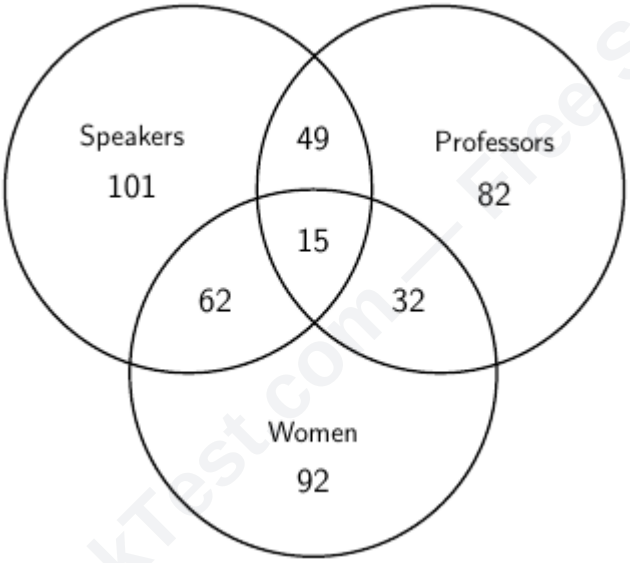
Q33. The term (aq) written after the symbol/formula of a substance in a chemical equation indicates that it is present in:

(a) gaseous state
(b) solid state
(c) liquid state

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(d) a solution in water

Q34. Study the diagram and answer the questions that follow. The numbers in different sections indicate the number of persons. How many women are speakers and NOT professors and how many professors are speakers and NOT women?



(a) 62 and 32, respectively
(b) 77 and 49, respectively
(c) 47 and 49, respectively
(d) 62 and 49, respectively

Q35. Madhu and Shiney together can complete a piece of work in 20 days, Shiney and Rosy together can complete the same work in 12 days, and Rosy and Madhu together can complete the work in 15 days. In how many days will three of them complete it together?

(a) 12 days
(b) 5 days
(c) 15 days
(d) 10 days

Q36. Which of the following statements is/are correct?

(A) Resistance is independent of temperature.
(B) The more the voltage across a conductor, the more is the resistance.
(C) The S.I unit of resistance is ohm.

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

Q37. If $a + b + c = 6$ and $ab + bc + ca = -2$, then find the value of $a^3 + b^3 + c^3 - 3abc$.

(a) 240
(b) 192
(c) 200
(d) 252

Q38. The elements which have 2 electrons in their outermost cell are generally:

(a) non-metals
(b) metalloids
(c) noble gases
(d) metals

Q39. Find the roots of the equation $x^2 + 11x - 26 = 0$.

(a) -2 and 11
(b) -13 and 2
(c) 11 and 2
(d) 13 and -2

Q40. Rajiv's salary was first decreased by 40% and subsequently increased by 50%. How much percent did he lose from his initial salary?

(a) 12%
(b) 14%
(c) 10%
(d) 15%

Q41. Study the given number, symbol series and answer the question that follows.

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

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

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

Q42. Who has won his eighth title at the 19th Asian 100 UP Billiards Championship, 2022?

(a) Geet Sethi
(b) Aditya Mehta
(c) Dhruv Sitwala
(d) Pankaj Advani

Q43. Find the arithmetic mean of 5, 15, 23, 26, and 29.

(a) 17.6
(b) 19.6
(c) 18.6
(d) 20.6

Q44. What changes take place in the guard cells that cause the opening of stomata?

(a) Water enters the guard cells and they shrink
(b) Water comes out of the guard cells and they shrink
(c) Water enters the guard cells and they swell
(d) Water comes out of the guard cells and they swell

Q45. Microfinance in India is a form of financial service which provides small loans and other financial services to poor and low-income households for _____.

(a) medium and long term
(b) long term
(c) short term
(d) medium term

Q46. Which of the following is a quadratic equation?

A. $x(x - 4) = 2x + x^2 - 7$
B. $5 (2y + 3) - 6y = 5y(y^2 - 8y)$
C. $k(k + 1) - k(k - 2) 2k = 0$
D. $p(p^2 + 7) = p^2 + p^3 - 18$

(a) Only D
(b) Only C

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(c) Only A
(d) Only B

Q47. In a class of 17 students, each scored differently. A's rank from the top is 9^(th), while B's rank from the bottom is 11^(th), C's rank from the top is better than A but worse than B. What is C's rank from the top?
(a) 9th
(b) 8^(th)
(c) 7^(th)
(d) 6^(th)

Q48. Which of the following harvest festivals is mainly celebrated in South India?
(a) Onam
(b) Uttarayan
(c) Bihu
(d) Maghi

Q49. The odometer of a car reads 12,000 km at the start of a trip and 12,800 km at its end. If the trip took 4 hours, then the average speed of car in m/sec is:
(a) 430/8 m/sec
(b) 500/9 m/sec
(c) 188/9 m/sec
(d) 270/8 m/sec

Q50. In a certain code language, 'FEELING' is written as 'VVUOTMR' and 'HEAVILY' is written as 'ZVSEBOR'. How will 'FORTUNE be written in that language?
(a) ILGUVMF
(b) ULIGFMV
(c) ILUGFMV
(d) ILUGVMF

Q51. Read the given statement and conclusions carefully. Assuming that the information given in the statements is true, decide which of the given conclusions logically follow(s) from the statement

Statement:

Onion prices have skyrocketed due to shortage of onions and largescale hoarding by a few traders.

Conclusions:

I. The government must crackdown on the hoarders and impose stringent penalties on hoanders.

II. People must stop eating onions and switch to potatoes instead.

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

Q52. Which of the following numbers will replace the question mark (?) in the given series?

12, 14, 31, 97, 393, ?

(a) 1970
(b) 1972
(c) 1971
(d) 1965

Q53. Five houses, P, Q, R., S and T, are located in the same colony. T is 40 m to the east of Q. P is 30 m to the south of Q. R is 40 m to the west of Q. Q is 35 m to the south of S. In which direction is R with reference to T?
(a) North
(b) West
(c) East
(d) South

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Q54. The component of white light that has maximum refractive index is:

(a) red
(b) yellow
(c) violet
(d) green

Q55. Six boxes, A, B, C, D, E and F, are kept one over the other but not necessarily in the same order. Only one box is kept between B and D. Only two boxes are kept between B and E. E is kept just above A. F is kept just above B. Box A is not kept in the bottom most position. Which box is kept at the top?

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

Q56. Seema squeezed a lemon and collected the juice in a glass. She realised that its sourness reduced when she added some water to it. What is the effect of addition of water on the concentration of hydroxide ions?

(a) It remains constant
(b) It increases
(c) It reduces
(d) It first increases and then decreases

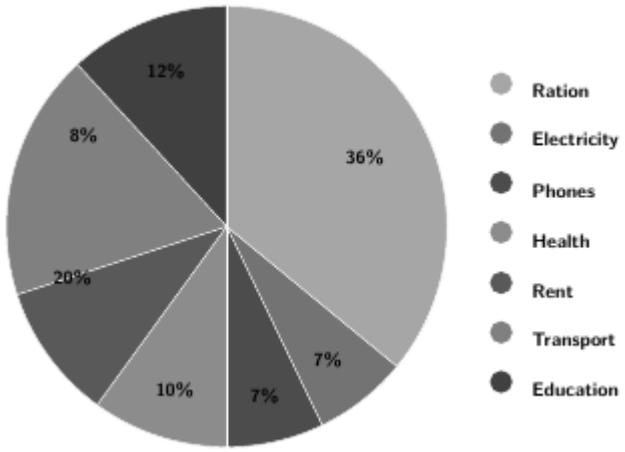
Q57. In the given letter-cluster pairs, the first letter-cluster is related to the second letter-cluster following a certain logic. Study the given pairs carefully, and from the given options, select the pair that follows the same logic.

KDRB : PWIY

UNCG : FMXT

(a) FTZN : UGVW
(b) DHEL : WSVO
(c) VQCX : EPXZ
(d) TNDK : GMRP

Q58. The following chart shows the expenditure of a house on various heads. The total expenditure of the house is Rs. 85,200. Study the chart and answer the question.



How much more amount is spent on ration than on rent?

(a) Rs. 13,512
(b) Rs. 13,852
(c) Rs. 13,632
(d) Rs. 14,332

Q59. Which of the following rivers is NOT a tributary of River Brahmaputra?

(a) Subansiri
(b) Lohit
(c) Gandak

(d) Manas

Q60. The position of how many letters will remain unchanged if each of the letters in the word QUALITY is arranged in alphabetical order?

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

Q61. A shopkeeper sells 35 kg sugar for every 40 kg using false weights. How much percentage profit does he make if sells sugar at cost price (rounded off to two places of decimal)?

(a) 15.33%
(b) 14.28%
(c) 12.50%
(d) 17.66%

Q62. 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.

4 : 8 :: 8 : 32 :: 12 : ?

(a) 72
(b) 36
(c) 24
(d) 144

Q63. _____ determines the sex of fertilised eggs in a few reptiles.

(a) Moisture
(b) Autosome
(c) Temperature
(d) Allosome

Q64. Among six girls, Natasha, Yuvika, Aditi, Tanya, Shahnaz and Daljeet, each one has a different shortest among all. Aditi is taller than only Natasha and one another girl. Shahnaz is shorter than Daljeet, who is shorter than Yuvika. Who is the third tallest among all six girls?

(a) Aditi
(b) Yuvika
(c) Shahnaz
(d) Daljeet

Q65. A cuboidal room is of length 15 m, breadth 17 m, and height 21 m. Find the cost of painting its walls and ceiling at the rate of Rs. 40/m².

(a) Rs. 63,960
(b) Rs. 58,912
(c) Rs. 44,250
(d) Rs. 85,126

Q66. 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.

15 : 180 :: 17 : 204 :: 21: ?

(a) 252
(b) 240
(c) 248
(d) 232

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Q67. An electric heater rated 1000 W is used for 5 hours daily. For cost per unit of Rs. 6.00, calculate the total cost for running the device for the month of September (in Rs.).

(a) 900
(b) 500
(c) 180
(d) 150

Q68. Given below are three statements and three conclusions. Take the statements to be true even if they are at variance with commonly known facts, and decide whether the conclusion's follows the given statements.

Statements:

I. Some lions are cats.

II. All cats are animals.

III. Some animals are not lions.

Conclusions:

I. Some animals are lions.

II. All lions are animals.

III. No animal is a lion.

(a) Conclusions II and III follow
(b) Only conclusion I follows
(c) Only conclusion III follows
(d) None of the conclusions follow

Q69. simplify 47/9×78/9×81+23/4.

(a) 3055.25
(b) 3053.25
(c) 3053.75
(d) 3055.75

Q70. In a parallelogram two adjacent sides are in the ratio 3 : 2 and the perimeter is 65 cm. The length of each of the two shorter sides of this parallelogram is:

(a) 18 cm
(b) 21 cm
(c) 19 cm
(d) 13 cm

Q71. Telecom Company Bharti Airtel has signed an agreement to buy what percentage of Vodafone's stake in Indus Towers?

(a) 4.7
(b) 6.7
(c) 5.7
(d) 3.7

Q72. A statement is given, followed by four conclusions given in the options. Find out which conclusion is true based on the given statement.

Statement: X < Z = T > V > P < Y = O

(a) T > Y
(b) O > P
(c) T < X
(d) V > Y

Q73. Find the selling price of an article (in Rs.) if the cost price is Rs. 4,500 and gain is 5%.

(a) 4,675
(b) 4,657
(c) 4,725

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(d) 4,527

Q74. Which of the following says, "The laws apply in the same manner to all, regardless of a person's status"?

(a) Rule of Government
(b) Rule of Power
(c) Rule of State
(d) Rule of Law

Q75. As per Article 80 of the Constitution of India, _____ is the maximum strength of Rajya Sabha in India.

(a) 250
(b) 542
(c) 475
(d) 122

Q76. G, H, I, J, K and L are the initials of six girls who were sitting around a circular table discussing the venue of their picnic. They were all facing the table's centre. L was not immediately next to either G or H. I was second to the left of K. There were exactly two girls between J and G. I was to the immediate left of G. K was to the immediate left of H. who was to the immediate right of L?

(a) I
(b) G
(c) J
(d) K

Q77. Three statements are given, followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

All gifts are letters.

All letters are chats.

All words are gifts.

Conclusions:

I. Some chats are words.

II. All gifts are chats.

III. Some words are not letters.

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

Q78. Which of the following blood components aid in the formation of clots?

(a) Platelets
(b) Plasma proteins
(c) White blood cells
(d) Red blood cells

Q79. Which of the following options is the closest approximate value which will come in place of question mark (?) in the following equation?

12.999 - 3.998 + 14.002 × 3.998 + 27.008 ÷ 3.001 + 35.999 ÷ 5.998 = ?

(a) 89
(b) 80
(c) 72
(d) 68

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Q80. Which of the following terms will replace the question mark (?) in the given series to make it logically complete?

8G, 14C, 20Y, 26U, ?

(a) 32Q
(b) 32P
(c) 30R
(d) 30Q

Q81. A sum of money amounts to Rs. 13,380 after 3 years and to Rs. 20,070 after 6 years at compound interest compounded annually. Find the sum.

(a) Rs. 8,920
(b) Rs. 7,020
(c) Rs. 7,007
(d) Rs. 8,505

Q82. A 2 Ω resistance is connected to a 4 Ω resistance in series. Their equivalent resistance will be:

(a) 4/3 Ω
(b) 3/4 Ω
(c) 6 Ω
(d) 1 Ω

Q83. Koraput, Rayagada, Kalahandi, Balangir districts of Odisha are famous for which mining mineral?

(a) Bauxite
(b) Limestone
(c) Copper
(d) Mica

Q84. What part of the plant is used to store waste material?

(a) Vacuoles
(b) Plastids
(c) Lysosomes
(d) Nucleus

Q85. Select the correct option with respect to the following.

Two triangles are similar if:

a) Any two of their sides are equal

b) their corresponding sides are proportional

c) Any two of their angles are equal

d) their corresponding angles are equal

(a) both a and d
(b) both b and d
(c) both b and c
(d) both a and b

Q86. The phenomenon due to which the relative motion between a conductor and a magnet produces a potential difference across the conductor is called:

(a) electrostatic force
(b) electromagnetism
(c) electromagnetic force
(d) electromagnetic induction

Q87. How many times in 48 hours are the hour and the minute hands of a correct clock in a straight line but opposite directions?

(a) 76
(b) 102

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(c) 44
(d) 94

Q88. On 16 March 2022, the Union Ministry for Road Transport and Highways inaugurated a pilot project for hydrogen based advanced Fuel Cell Electric Vehicle (FCEV). This pilot project was initiated by:
(a) Toyota Kirloskar Motor Pvt. Ltd.
(b) Tata Motors Pvt. Ltd.
(c) Maruti Suzuki India Limited
(d) Kia India Pvt. Limited.

Q89. In 1989 the _____ recommended constitutional recognition for the local government bodies.
(a) Khusro Committee
(b) Raja Chelliah Committee
(c) Sarkaria Commission
(d) PK Thungon Committee

Q90. Which part of the human brain controls the involuntary action of vomiting?
(a) Forebrain
(b) Midbrain
(c) Hindbrain
(d) Spinal cord

Q91. Kalpit is standing in a park facing the south direction. Then, he takes two consecutive clockwise turns of 45° each. Then, he takes a third turn of some degrees after which he is now facing the south-east direction. Of how many degrees and in which direction did he take the third turn?
(a) 135°, anticlockwise
(b) 90°, clockwise
(c) 135°, clockwise
(d) 90°, anticlockwise

Q92. Forests can be conserved by which of the following factors?
a) Regulated and planned cutting of trees
b) Control over forest fire
c) Construction of roads in the forest
d) Monoculture planting
e) Promotion of afforestation and reforestation
f) Proper utilisation of forest and forests products
g) Clearing land for cattle grazing
(a) d, e, f and g
(b) a, b, e and f
(c) a, c, d and e
(d) b, c, e and g

Q93. A boy standing in front of a magic mirror combination finds his head enlarged, body of same size and legs smaller in size. The mirrors used in the top, middle and bottom of the magic mirror arrangement in the respective order are:
(a) concave, plane, convex
(b) concave, convex, plane
(c) convex, concave, plane
(d) convex, plane, concave

Q94. Who built the Jal Mandir related to Jainism?
(a) King Asoka
(b) Rishabhadeva
(c) Parshvanatha

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(d) King Nandivardhan

Q95. What branch of biology focuses on the study of inheritance patterns?

(a) Evolution biology
(b) Genetics
(c) Biotechnology
(d) Anthropology

Q96. Who among the following won the final of the men's singles at the India Open 2022?

(a) Chirag Shetty
(b) Lakshya Sen
(c) Satwiksairaj Rankireddy
(d) Kidambi Srikanth

Q97. Evaluate. ((- 2)/5)^(- 2) × ((- 4)/5)^4

(a) 25/26
(b) 64/25
(c) 25/64
(d) 26/25

Q98. What was the profession of freedom fighter Deshbandhu Chittaranjan Das?

(a) Teacher
(b) Doctor
(c) Painter
(d) Lawyer

Q99. Each of the digits in the number 34135278 is arranged in ascending order from left to right. The position of how many digits will remain unchanged as compared to that in the original number?

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

Q100. As of July 2022, under which of the Social Security Insurance schemes is insurance provided with a premium of Rs. 20 per annum that is to be deducted from the account holder's bank account through auto-debit' facility in one instalment?

(a) Pradhan Mantri Vaya Vandana Yojana (PMVVY).
(b) Pradhan Mantri Suraksha Bima Yojana (PMSBY)
(c) Varishtha Pension Bima Yojana
(d) Pradhan Mantri Jeevan Jyoti Bima Yojana (PMJJBY)

ANSWER KEY

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

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91	a	92	b	93	a	94	d	95	b	96	b	97	b	98	d	99	b	100	b

SOLUTIONS

Q1. Answer: (a) the 8^(th) five-year plan

The correct answer is the 8th five-year plan

Key Points

• The economic reforms were initiated by the Narasimha Rao government during the 8th five-year plan.

• The 8th five-year plan spanned from 1992 to 1997.

• These reforms aimed at liberalizing the economy, promoting private sector participation, and integrating India into the global economy.

• Key measures included deregulation of industries, reduction in import tariffs, and opening up to foreign direct investment (FDI).

• The reforms marked a significant shift from the previous socialist policies to a more market-oriented approach.

Additional Information

• The economic liberalization in India was a response to a severe balance of payments crisis that the country faced in 1991.

• The reforms were spearheaded by the then Finance Minister Dr. Manmohan Singh under the leadership of Prime Minister P. V. Narasimha Rao.

• The New Economic Policy of 1991 included measures such as devaluation of the rupee, disinvestment in public sector enterprises, and tax reforms.

• The economic reforms led to a significant increase in India's GDP growth rate and transformed India into one of the fastest-growing economies in the world.

• The success of these reforms paved the way for further liberalization and economic policies in subsequent years.

Q2. Answer: (c) acid; base

The correct answer is acid; base

Key Points

• During a neutralization reaction, the H+ ion comes from an acid and the OH- ion comes from a base.

• When these ions combine, they form a water molecule (H2O).

• This reaction typically results in the formation of a salt and water as products.

• Neutralization reactions are fundamental in understanding the behavior of acids and bases in chemical reactions.

Additional Information

• Acids are substances that release hydrogen ions (H^+) in a solution.

• Bases are substances that release hydroxide ions (OH^-) in a solution.

• The pH scale is used to measure the acidity or basicity of a solution, with acids having a pH less than 7 and bases having a pH greater than 7.

• Neutralization reactions are important in various real-life applications, including antacid medications, agriculture, and environmental science.

Q3. Answer: (a) 0

Shortcut Trick

The product is a sequence of trigonometric sines starting from sin 90° down to sin 0°.

In any product of terms, if any one term is zero, the entire product becomes zero.

Since the last term is sin 0° = 0, the product of all terms is 0.

Therefore The correct answer is 0.

Alternate Method

Given:

Expression = sin 90° × sin 89° × sin 88° × sin 87° × ... × sin 0°

Formula Used:

The value of sin 0° = 0.

Calculations:

=> Let P = sin 90° × sin 89° × sin 88° × ... × sin 1° × sin 0°

=> We know that the value of sin 0° is 0.

=> P = (sin 90° × sin 89° × ... × sin 1°) × 0

=> P = 0

Therefore The correct answer is 0.

Additional Information

Standard Sine Values

Important values include sin 0° = 0, sin 30° = 1/2, sin 45° = 1/√2, sin 60° = √3/2, and sin 90° = 1.

Zero Product Property

If a series of numbers are multiplied together and at least one factor is zero, the result is always zero.

Similar Product Cases

In a product like cos 0° × cos 1° × ... × cos 100°, the result is 0 because cos 90° = 0.

Q4. Answer: (a) F E G P T C

Given:

Number/Symbol	**=**	**$**	**6**	**8**	**<**	**?**	**/**	**2**	**5**	**!**	**@**	**7**	**3**	**^**
Code	G	L	F	M	E	N	D	P	C	R	T	B	V	A

Conditions:

Conditions	**Coded as**
If the first element is a symbol and the last, a number	Then the first and last elements are to be coded as © and ¥, respectively.
If the first element is an odd number and the last, an even number	The code for these two are to be interchanged.
If both second and third elements are perfect square	The third element is to be coded as the code for the second element.

Now, consider the group of numbers and symbols: '5 < = 2 @ 6'

Step-by-step solution:

1. Code the elements using the given table:

• 5: C

• <: E

• =: G

• 2: P

• @: T

• 6: F

So initially, we have: 'C E G P T F'

2. Apply the conditions:

Check Condition (i): The first element is not a symbol, so this condition does not apply.

Check Condition (ii): The first element is an odd number (5) and the last element is an even number (2), so their codes should be interchanged. Therefore, 'P' and 'D' are interchanged.

After applying Condition (ii), we have: 'F E G P T C'

Check Condition (iii): The second element (6) and the third element (=) are not both perfect squares, so this condition does not apply.

Final coded group: 'F E G P T C'

Hence, the correct answer is "Option 1".

Q5. Answer: (d) 4 unit

Shortcut Trick

Area of equilateral triangle = (√3/4) × (side)²

Given Area = 4√3

(√3/4) × a² = 4√3

a² = 16 => a = 4

Therefore The correct answer is 4 unit.

Alternate Method

Given:
Area of the equilateral triangle = 4√3 sq. unit
Formula Used:
Area of equilateral triangle = √3/4 a²
Calculations:
=> Area = (√3 / 4) × side²
=> 4√3 = (√3 / 4) × side²
=> 4 = (1 / 4) × side²
=> side² = 4 × 4
=> side² = 16
=> side = √16
=> side = 4 unit
Therefore The correct answer is 4 unit.
Additional Information
Height of Equilateral Triangle
The altitude or height (h) of an equilateral triangle is given by h = (√3/2) × a.
Perimeter of Equilateral Triangle
Since all three sides are equal, the perimeter (P) is simply 3 × a.
Inradius and Circumradius
Inradius (r) = a / (2√3) and Circumradius (R) = a / √3.

Q6. Answer: (b) 5

Shortcut Trick
Recognize that the given equation 16x² − 8x + 1 = 0 is a perfect square: (4x − 1)² = 0.
Solving for x: 4x − 1 = 0 => 4x = 1 => x = 1/4.
Substitute x = 1/4 into the required expression: 16(1/4)² + 1/(4(1/4)²).
Value = 16(1/16) + 1/(4 × 1/16) => 1 + 1/(1/4) => 1 + 4 = 5.
Therefore The correct answer is 5.
Alternate Method
Given:
Quadratic Equation: 16x² − 8x + 1 = 0
Target Expression: 16x² + 1/(4x²)
Formula Used:
Factorization of Quadratic Equation ax² + bx + c = 0 and direct substitution.
=> 16x² − 4x − 4x + 1 = 0
=> 4x(4x − 1) − 1(4x − 1) = 0
=> (4x − 1)(4x − 1) = 0
=> 4x − 1 = 0
=> x = 1/4
=> Now, substitute x = 1/4 in 16x² + 1/(4x²):
=> 16(1/4)² + 1 / (4 × (1/4)²)
=> 16 × (1/16) + 1 / (4 × 1/16)
=> 1 + 1 / (1/4)
=> 1 + 4 = 5
Therefore The correct answer is 5.
Additional Information
Perfect Square Trinomial
An expression of the form a² − 2ab + b² can be simplified as (a − b)². In this case, (4x)² − 2(4x)(1) + 1² fits the pattern.
Nature of Roots
For a quadratic equation ax² + bx + c = 0, if the discriminant D = b² − 4ac = 0, the roots are real and equal. Here, D = (−8)² − 4(16)(1) = 64 − 64 = 0.
Reciprocal Identities

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If $4x + 1/(4x) = k$, then $16x^2 + 1/(16x^2) = k^2 - 2$. Dividing the given equation by 4x gives $4x - 2 + 1/(4x) = 0$, or $4x + 1/(4x) = 2$.

Q7. Answer: (a) positive when the image is virtual and negative when the image is real

The correct answer is option 1

Key Points

• The sign of the magnification produced by a concave mirror is positive when the image is virtual and negative when the image is real.

• In a concave mirror, when the object is placed between the focal point and the mirror, a virtual, erect, and magnified image is formed, resulting in a positive magnification.

• When the object is placed beyond the focal point, a real, inverted, and reduced or enlarged image is formed, resulting in a negative magnification.

• This property is a consequence of the mirror equation and the nature of image formation by concave mirrors.

Additional Information

• Magnification (m) is given by the ratio of the height of the image (h_i) to the height of the object (h_o): m=hihom=hihom=hihom=hihom=hiho.

• For mirrors, magnification can also be expressed in terms of object distance (u) and image distance (v): m=−vum=−vum=−vum=−vum=−vu.

• A positive magnification indicates that the image is erect and virtual.

• A negative magnification indicates that the image is inverted and real.

• Concave mirrors are used in various applications such as telescopes, shaving mirrors, and headlights due to their ability to form real and magnified images.

Q8. Answer: (b) A

The correct answer is 2

Key Points

• Element A (9) corresponds to Fluorine, which is a halogen located in Group 17 of the periodic table.

• Element B (11) corresponds to Sodium, which is an alkali metal located in Group 1 of the periodic table.

• Element C (19) corresponds to Potassium, which is also an alkali metal located in Group 1 of the periodic table.

• Element D (37) corresponds to Rubidium, another alkali metal located in Group 1 of the periodic table.

• Among these elements, Element A (Fluorine) is the odd one out as it is the only element that is not an alkali metal.

Additional Information

• Alkali metals are located in Group 1 of the periodic table and include elements like Sodium (Na), Potassium (K), and Rubidium (Rb).

• Halogens are located in Group 17 of the periodic table and include elements like Fluorine (F).

• Elements in the same group typically share similar chemical properties.

• The periodic table is arranged so that elements with similar properties fall into the same vertical columns, known as groups.

Q9. Answer: (a) Western Ghats

The correct answer is Western Ghats

Key Points

• The Western Ghats receive the maximum rainfall from the South-west Monsoon winds in India.

• This mountain range runs parallel to the western coast of the Indian peninsula and significantly influences the monsoon patterns.

• The Western Ghats are known for their rich biodiversity and are recognized as one of the world's eight "hottest hotspots" of biological diversity.

• Regions such as Maharashtra, Goa, Karnataka, Kerala, and Tamil Nadu benefit from the heavy rainfall brought by the South-west Monsoon.

Additional Information

• The South-west Monsoon typically arrives in India around early June and lasts until September, bringing the majority of the country's annual rainfall.

• The monsoon is crucial for agriculture in India, as it directly impacts the water supply for irrigation and reservoirs.

• Areas like Cherrapunji and Mawsynram in Meghalaya, although not part of the Western Ghats, are also known for receiving extremely high rainfall during the monsoon season.

• The Western Ghats not only contribute to rainfall distribution but also play a significant role in the climate and weather patterns of the Indian subcontinent.

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Q10. Answer: (a) 50

Shortcut Trick

For a continued proportion a : b :: b : c, the third proportional c = $b^2 \div a$.

Here, a = 18 and b = 30.

x = (30 × 30) ÷ 18

x = 900 ÷ 18 = 50

Therefore The correct answer is 50.

Alternate Method

Given:

First term (a) = 18

Mean term (b) = 30

Third term (c) = x

Formula Used:

If a, b, c are in continued proportion, then a/b = b/c => $b^2 = a \times c$

Calculations:

=> 18 : 30 :: 30 : x

=> 18 / 30 = 30 / x

=> 18 × x = 30 × 30

=> 18x = 900

=> x = 900 ÷ 18

=> x = 50

Therefore The correct answer is 50.

Additional Information

Mean Proportional

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

Fourth Proportional

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

Continued Proportion

Three quantities a, b, c are in continued proportion if a : b = b : c.

Q11. Answer: (b) 28 hours

Shortcut Trick

Ratio of efficiency A : B : C = 1 : 2 : 4

Total efficiency of (A + B + C) = 1 + 2 + 4 = 7 units/hr

Total capacity of tank = Total efficiency × Total time = 7 × 4 = 28 units

Time taken by Pipe A = Total capacity ÷ Efficiency of A = 28 ÷ 1 = 28 hours

Therefore The correct answer is 28 hr.

Alternate Method

Pipes	Efficiency Ratio	Total Work	Efficiency (Units)
Pipe A	1	7 × 4 = 28	1
Pipe B	2	2	
Pipe C	4	4	

Given:

Total time taken by A, B, and C together = 4 hours

Efficiency relation: C = 2B and B = 2A

Calculations:

=> Let the efficiency of Pipe A be 1 unit/hr.

=> Efficiency of Pipe B = 2 × 1 = 2 units/hr

=> Efficiency of Pipe C = 2 × 2 = 4 units/hr

=> Total efficiency of (A + B + C) = 1 + 2 + 4 = 7 units/hr

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=> Total capacity of the tank = Efficiency × Time = 7 × 4 = 28 units

=> Time taken by Pipe A alone = 28 ÷ 1 = 28 hours

Therefore The correct answer is 28 hr.

Additional Information

Efficiency and Time Relationship

Efficiency is inversely proportional to the time taken to complete a task. Work = Efficiency × Time.

Pipes and Cisterns Logic

If an inlet pipe fills in x hours and an outlet pipe empties in y hours, the net work done in one hour is (1/x − 1/y).

Q12. Answer: (c) Dr. Jitendra Singh

The correct answer is Dr. Jitendra Singh

Key Points

• "Dare2eraD TB" by the Department of Biotechnology, Ministry of Science & Technology, was launched on the occasion of World TB Day.

• The initiative was launched by Dr. Jitendra Singh.

• World TB Day is observed on March 24 each year to raise public awareness about the devastating health, social, and economic consequences of tuberculosis.

• The program aims to eliminate tuberculosis (TB) in India by the year 2025.

Additional Information

• Tuberculosis is a potentially serious infectious disease that mainly affects the lungs. The bacteria that cause TB are spread from one person to another through tiny droplets released into the air via coughs and sneezes.

• India has the highest burden of both TB and multidrug-resistant TB. The government has implemented the National Strategic Plan for TB Elimination 2017-2025 to tackle this issue.

• The Revised National TB Control Programme (RNTCP) is being strengthened and integrated with the health system to ensure comprehensive coverage and effective management of TB cases.

Q13. Answer: (a) 32

Shortcut Trick

LCM of 3, 4, 5, and 6 is 60.

Divide 2488 by 60 → 2488 ÷ 60 gives remainder 28.

Least number to be added = Divisor − Remainder = 60 − 28 = 32.

Therefore The correct answer is 32.

Alternate Method

Given: Number = 2488, Divisors = 3, 4, 5, 6.

Formula: Least number added = LCM(divisors) − (Number % LCM).

=> LCM of (3, 4, 5, 6):

=> 3 = 3^1, 4 = 2^2, 5 = 5^1, 6 = 2 × 3.

=> LCM = 2^2 × 3 × 5 = 4 × 3 × 5 = 60.

=> Dividing 2488 by 60:

=> 2488 = 60 × 41 + 28.

=> Remainder = 28.

=> Least number to be added = 60 − 28 = 32.

Therefore The correct answer is 32.

Additional Information

LCM (Least Common Multiple)

The smallest positive integer that is divisible by each of the given numbers. It is found by taking the product of the highest powers of all prime factors.

Divisibility Rules

A number is divisible by 60 if it is divisible by 3, 4, and 5 simultaneously. To find the next multiple, add (Divisor − Remainder).

Subtraction Case

If the question asks for the least number to be subtracted, the answer is simply the Remainder itself.

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Q14. Answer: (c) Both a and b

The correct answer is 3 Both a and b.

Key PointsLaw of Demand in Economics:

• The Law of Demand is a fundamental principle in economics which states that, all else being equal, as the price of a good increases, the quantity demanded of that good decreases, and vice versa. This is reflected in option a.

• Demand and Marginal Utility: Demand is derived from the law of diminishing marginal utility, which is based on the fact that consumers prioritize satisfying their most urgent needs first. This is captured in option b.

• While the shape and magnitude of demand can shift in response to various factors, including price, this is a broader concept that encompasses changes in demand rather than the fundamental law itself. Therefore, option c is not specifically about the Law of Demand.

• Hence, the correct answer is both a and b.

Q15. Answer: (d) angle of deviation

The correct answer is angle of deviation.

Key Points

• The angle of deviation is the angle between the incident ray and the emergent ray.

• In a prism, the ray of light bends twice, once when it enters the prism and once when it exits.

• The angle of deviation depends on the angle of incidence, the refractive index of the prism material, and the angle of the prism.

• The angle of deviation is minimum when the angle of incidence is such that the light ray passes symmetrically through the prism.

Additional Information

• Snell's Law

• It describes how light bends when it passes from one medium to another.

• It is given by the formula: *n1 * sin(θ1) = n2 * sin(θ2)*, where n1 and n2 are the refractive indices of the two media, and θ1 and θ2 are the angles of incidence and refraction, respectively.

• Refractive Index

• The refractive index of a medium is a measure of how much it can bend light.

• It is defined as the ratio of the speed of light in a vacuum to the speed of light in the medium.

• Prism Formula

• The relationship between the angle of incidence, angle of refraction, and the angle of the prism can be described using the prism formula: A = r1 + r2, where A is the angle of the prism and r1 and r2 are the angles of refraction at the two surfaces of the prism.

Q16. Answer: (d) 3

Given: (left) 347, 486, 627, 113, 721, 418, 779 (right)

If 2 is added to the digit in the hundred's place of each number given above, the modified numbers will be:

• 347 → 547

• 486 → 686

• 627 → 827

• 113 → 313

• 721 → 921

• 418 → 618

• 779 → 979

Now, we need to check if the modified digit in the hundred's place is exactly divisible by the digit in the ten's place:

• 547: 5 ÷ 4 = not exactly divisible

• 686: 6 ÷ 8 = not exactly divisible

• 827: 8 ÷ 2 = exactly divisible

• 313: 3 ÷ 1 = exactly divisible

• 921: 9 ÷ 2 = not exactly divisible

• 618: 6 ÷ 1 = exactly divisible

• 979: 9 ÷ 7 = not exactly divisible

So, the modified hundred's place digit is exactly divisible by the ten's place digit in 3 numbers.

The correct answer is "Option 4".

Q17. Answer: (c) $ZnCO_3 \rightarrow ZnO + CO_2$

The correct answer is option 3

Key Points

• Thermal decomposition reaction is a type of chemical reaction where a single compound breaks down into two or more simpler substances when heated.

• In the given options, $ZnCO_3 \rightarrow ZnO + CO_2$ (option 3) is an example of a thermal decomposition reaction.

• When zinc carbonate ($ZnCO_3$) is heated, it decomposes into zinc oxide (ZnO) and carbon dioxide (CO_2).

• Other options like the decomposition of water (H_2O) and sodium chloride (NaCl) involve different types of reactions such as electrolysis.

Additional Information

• Thermal decomposition reactions require energy in the form of heat to break chemical bonds in the compound undergoing decomposition.

• Common examples of thermal decomposition reactions include the breakdown of calcium carbonate ($CaCO_3$) into calcium oxide (CaO) and carbon dioxide (CO_2), and the decomposition of potassium chlorate ($KClO_3$) into potassium chloride (KCl) and oxygen (O_2).

• These reactions are important in various industrial processes, such as the production of lime from limestone and the preparation of oxygen in laboratories.

Q18. Answer: (b) 213

Shortcut Trick

To find the greatest number that leaves the same remainder, find the HCF of the differences between the numbers.

Difference 1: 9806 − 8954 = 852

Difference 2: 11297 − 9806 = 1491

Difference 3: 11297 − 8954 = 2343

HCF(852, 1491, 2343) = 213 because 852 = 4 × 213 and 1491 = 7 × 213.

Therefore The correct answer is 213.

Alternate Method

Given: Numbers are 8954, 9806, and 11297.

Formula Used: Required number = HCF(|x − y|, |y − z|, |z − x|)

=> Step 1: Calculate the differences between the numbers.

=> 9806 − 8954 = 852

=> 11297 − 9806 = 1491

=> Step 2: Find the HCF of 852 and 1491.

=> Using division method: 1491 = 852 × 1 + 639

=> 852 = 639 × 1 + 213

=> 639 = 213 × 3 + 0

=> The Last Divisor is 213.

Therefore The correct answer is 213.

Additional Information

HCF with same remainder

The largest number that divides x, y, and z leaving the same remainder is HCF(|x − y|, |y − z|, |z − x|).

HCF with different remainders

The largest number that divides x, y, and z leaving remainders a, b, and c is HCF(x − a, y − b, z − c).

LCM concept

The smallest number which when divided by x, y, and z leaves the same remainder r is [LCM(x, y, z) + r].

Q19. Answer: (c) P has the class in September.

Given: Six persons, L, M, N, O, P and Q, have cooking classes in different months of the same year, viz. February, March, June, August, September and December.

1) P has the class immediately before Q.

2) Only M has the class before O.

3) L has the class immediately after N and before Q.

Month	Person

February	M
March	O
June	N
August	L
September	P
December	Q

Check all the options:

Option (1): Q has the class in February → False

Option (2): M has the class in March → False

Option (3): P has the class in September → True

Option (4): L has the class in June → False

So, P's class is in September.

Hence, the correct answer is "Option 3".

Q20. Answer: (a) W

According to the given information,

1) W is to the immediate right of Y.

2) W and Z are not at the opposite corners

Here, we can see that W sits opposite to X.

Hence, the correct answer is "W".

Q21. Answer: (c) -2x2 + 11x - 39

Calculation:

We have,

x2 + 5x - 12 - 3(x2 - 2x + 9)

=> x2 + 5x - 12 - 3x2 + 6x - 27

=> -2x2 + 11x - 39

Therefore Option 3 is the correct answer.

Q22. Answer: (c) Article 343(1)

The correct answer is Article 343(1)

Key Points

• Article 343(1) of the Indian Constitution specifies that "The official language of the Union shall be Hindi in Devanagari script."

• The Constitution initially provided for the continued use of English for all official purposes of the Union for a period of 15 years from its commencement, after which Hindi was to become the sole official language.

• However, due to the linguistic diversity of India, the Official Languages Act, 1963 was passed, allowing for the continued use of English alongside Hindi for official purposes.

• This provision highlights the importance of Hindi as the official language, while also recognizing the practical need for English in official communication.

Additional Information

• The Constitution of India was adopted by the Constituent Assembly on 26th November 1949 and came into effect on 26th January 1950.

• It lays down the framework defining fundamental political principles, establishes the structure, procedures, powers, and duties of government institutions, and sets out fundamental rights, directive principles, and the duties of citizens.

• The Constitution of India is the longest written constitution of any country in the world.

• It declares India a sovereign, socialist, secular, and democratic republic, assuring its citizens justice, equality, and liberty, and endeavors to promote fraternity.

• The Official Languages Act, 1963 plays a crucial role in the continued use of English for official purposes, reflecting the linguistic diversity of the nation.

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Q23. Answer: (d) 318

The logic followed here is:

Hence, the correct answer is "318".

Q24. Answer: (d) To freeze the production of CFCs at 1986 level

The correct answer is to freeze the production of CFCs at 1986 level

Key Points

• The main aim of the agreement made by UNEP in 1987 was to freeze the production of CFCs at the 1986 level.

• This agreement is known as the Montreal Protocol on Substances that Deplete the Ozone Layer.

• The protocol was designed to protect the ozone layer by phasing out the production of numerous substances responsible for ozone depletion, primarily chlorofluorocarbons (CFCs).

• The Montreal Protocol is considered one of the most successful environmental agreements to date.

Additional Information

• The United Nations Environment Programme (UNEP) facilitated the Montreal Protocol, which was agreed upon on September 16, 1987, and entered into force on January 1, 1989.

• As of today, the protocol has undergone several amendments and adjustments to include more substances and to accelerate the phase-out schedules.

• The Montreal Protocol has significantly contributed to the recovery of the ozone layer and is a model for international cooperation on environmental issues.

• Due to its success, September 16 is celebrated as International Day for the Preservation of the Ozone Layer.

Q25. Answer: (d) Both the statements are true.

The correct answer is 4 Only.

Key Points

• Sodium hydroxide (NaOH) is indeed prepared by the chlor-alkali process. This process involves the electrolysis of brine (sodium chloride solution), which produces chlorine gas, hydrogen gas, and sodium hydroxide. Hence, Statement I is correct.

• Sodium hydroxide is also used in the production of artificial textile fibers such as rayon. Rayon is made from cellulose, which is treated with sodium hydroxide to produce a solution that can be spun into fibers. Hence, Statement II is also correct.

• Given that both statements are correct, the correct answer is option 4.

Q26. Answer: (d) ASIGMA

The correct answer is ASIGMA

Key Points

• ASIGMA is the in-house messaging application released by the Indian Army for the military sector.

• The app stands for Army Secure IndiGeneous Messaging Application (ASIGMA), designed to provide a secure communication platform within the army.

• This app replaces other commercial messaging applications to ensure enhanced security and confidentiality of military communications.

• ASIGMA is developed as part of the Army's ongoing efforts to modernize communication systems and enhance operational efficiency.

Additional Information

• The Indian Army has been focusing on indigenization and self-reliance in its technology and communication systems.

• ASIGMA is part of the broader initiative to reduce dependency on foreign applications and improve the security of sensitive communications.

• The app is expected to be regularly updated with new features and security enhancements to keep pace with evolving threats.

• In addition to ASIGMA, the Indian Army has been working on other indigenous projects to enhance its technological capabilities and operational readiness.

Q27. Answer: (b) Both the statements are correct.

The correct answer is 2 Only.

Key PointsHomologous Series:

• A homologous series is a series of compounds in which the same functional group substitutes for hydrogen in a carbon chain. Hence, Statement I is correct.

• As the molecular mass increases in any homologous series, a gradation in physical properties is observed. This means properties such as boiling point, melting point, and solubility change progressively with increasing molecular mass. Hence, Statement II is correct.

• For example, in the homologous series of alkanes (methane, ethane, propane, etc.), the boiling point increases with increasing molecular mass.

• This gradation in physical properties is due to the increasing van der Waals forces as the molecular size increases.

Based on the above points, both Statement I and Statement II are correct. Therefore, the correct answer is 2 Only.

Q28. Answer: (a) 14

Shortcut Trick

For an algebraic expression of the form $x + 1/x = k$, the value of $x^2 + 1/x^2$ is always $k^2 - 2$.

Given the value $k = 4$.

Applying the shortcut formula: $4^2 - 2 = 16 - 2 = 14$.

Therefore The correct answer is 14.

Alternate Method

Given:

The linear equation is $x + 1/x = 4$.

Formula Used:

Using the standard algebraic identity: $(a + b)^2 = a^2 + b^2 + 2ab$

Calculations:

$\Rightarrow (x + 1/x)^2 = 4^2$ (Squaring both sides of the equation)

$\Rightarrow x^2 + (1/x)^2 + 2 \times x \times (1/x) = 16$

$\Rightarrow x^2 + 1/x^2 + 2 = 16$

$\Rightarrow x^2 + 1/x^2 = 16 - 2$

$\Rightarrow x^2 + 1/x^2 = 14$

Therefore The correct answer is 14.

Additional Information

Negative Sign Identity

If the given expression is $x - 1/x = k$, then the value of $x^2 + 1/x^2$ is $k^2 + 2$.

Cubic Identity Relation

If $x + 1/x = k$, then the value of $x^3 + 1/x^3$ is calculated as $k^3 - 3k$.

Higher Power (Quartic) Relation

If $x + 1/x = k$, then $x^4 + 1/x^4 = (k^2 - 2)^2 - 2$.

Square Root Relation

If $x^2 + 1/x^2 = k$, then $x + 1/x = \sqrt{(k + 2)}$.

Q29. Answer: (b) 17/3

Calculation:

We have,

$23k - 5 = 4096$

$\Rightarrow 23k - 5 = 2^{12}$

Now,

$3k - 5 = 12$

$\Rightarrow 3k = 12 + 5$

$\Rightarrow k = 17/3$

Therefore Option 2 is the correct answer.

Q30. Answer: (b) 93

Given Equation: $64 + 32 - 8 \times 11 \div 3 = ?$

BODMAS Rule:

Decoding the given information:

Symbol	•	•	÷	×
Meaning	•	÷	×	•

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

$\Rightarrow 64 - 32 \div 8 + 11 \times 3$

=> 64 - 4 + 11 × 3

=> 64 - 4 + 33

=> 97 - 4

=> 93

Hence, the correct option is "Option 2".

Q31. Answer: (d) 21.6%

Calculation:

Vishal's sale in May = 125

Total sale in May = (125 + 140 + 188 + 125) = 578

Percentage contribution of Vishal's May sale in the total sale of May = (125/578) × 100

=> 21.6%

Therefore Option 4 is the correct answer.

Q32. Answer: (d) Electric generator

The correct answer is Electric generator

Key Points

• Electric generator is based on the principle of electromagnetic induction.

• Electromagnetic induction is the process of generating electric current with a changing magnetic field.

• When a conductor moves through a magnetic field, an electromotive force (EMF) is induced in the conductor.

• This principle was discovered by Michael Faraday in 1831 and forms the working basis of generators.

• Generators convert mechanical energy into electrical energy using this principle, making them essential in power generation.

Additional Information

• Electric motors work on the principle of electromagnetic induction but in reverse, converting electrical energy into mechanical energy.

• Electric fans use electric motors to convert electrical energy into mechanical energy to create airflow.

• Electric bulbs convert electrical energy into light energy through the heating of a filament.

• While electric motors and electric fans also involve electromagnetic principles, they are not primarily based on the principle of electromagnetic induction for generating electricity.

Q33. Answer: (d) a solution in water

The correct answer is a solution in water

Key Points

• The term (aq) stands for aqueous, which means the substance is dissolved in water.

• In a chemical equation, indicating a substance as (aq) specifies that it is in an aqueous solution.

• This is different from other states of matter such as solid (s), liquid (l), and gas (g).

• An aqueous solution means that the substance is mixed with water, forming a homogeneous mixture.

Additional Information

• Water is often called the "universal solvent" because it can dissolve more substances than any other liquid.

• In chemical reactions, the state of the substances involved is crucial for predicting the outcome and understanding the reaction mechanism.

• The use of (aq) helps chemists and students to quickly identify that the substance is in a solution form, which can affect the reaction rate and equilibrium.

• Common examples of aqueous solutions include saltwater (NaCl in water) and sugar water (C12H22O11 in water).

Q34. Answer: (d) 62 and 49, respectively

→ The number of women who are speakers but not professor = 62

→ The number of professors who are speakers and not women = 49

Hence, the correct answer is "62 and 49, respectively".

Q35. Answer: (d) 10 days

Shortcut Trick

Combined efficiency of (Madhu + Shiney + Rosy) × 2 = Total Efficiency.

Total Work = LCM(20, 12, 15) = 60 units.

Efficiencies: (M+S) = 3, (S+R) = 5, (R+M) = 4.

Sum of efficiencies = 3 + 5 + 4 = 12 (this is twice the combined efficiency).

Efficiency of (M+S+R) = 12 ÷ 2 = 6 units/day.

Time taken = 60 ÷ 6 = 10 days.

Therefore The correct answer is 10 days.

Alternate Method

Given:

Time taken by Madhu and Shiney = 20 days

Time taken by Shiney and Rosy = 12 days

Time taken by Rosy and Madhu = 15 days

Person	Days	Total Work	Efficiency
Madhu + Shiney	20	60	3
Shiney + Rosy	12	5	
Rosy + Madhu	15	4	

Calculations:

=> Adding the efficiencies: 2 × (Madhu + Shiney + Rosy) = 3 + 5 + 4

=> 2 × (Madhu + Shiney + Rosy) = 12

=> Efficiency of (Madhu + Shiney + Rosy) = 12 ÷ 2 = 6

=> Time taken together = Total Work ÷ Combined Efficiency

=> Time taken = 60 ÷ 6 = 10 days

Therefore The correct answer is 10 days.

Additional Information

Combined Work Formula

When pairs work together, the individual efficiency of one person (e.g., Madhu) can be found by: [Total Efficiency (M+S+R)] − [Efficiency of (S+R)].

Work and Time Relationship

Time taken is inversely proportional to Efficiency. Time = Total Work ÷ Efficiency.

LCM Method for Work

Using the Least Common Multiple (LCM) of the given time periods as the 'Total Work' simplifies calculations into whole numbers instead of fractions.

Q36. Answer: (c) Only C

Concept:

Let’s analyze each statement:

(A) Resistance is not independent of temperature. In fact, resistance of most conductors increases with temperature due to increased collision of electrons. So this statement is Incorrect.

(B) Resistance is not directly affected by voltage. According to Ohm’s law, V = IR, resistance is a property of the material and does not increase just because voltage increases. So this statement is Incorrect.

(C) The S.I. unit of resistance is ohm (Ω), which is absolutely Correct.

Q37. Answer: (d) 252

Shortcut Trick

Use the direct algebraic identity: $a^3 + b^3 + c^3 − 3abc = (a + b + c) × [(a + b + c)^2 − 3(ab + bc + ca)]$

Substitute the given values: Sum (S) = 6 and Sum of products (P) = −2

Value = $6 × [6^2 − 3 × (−2)]$

Value = 6 × [36 + 6] = 6 × 42 = 252

Therefore The correct answer is 252.

Alternate Method

Given:

a + b + c = 6

ab + bc + ca = −2

Formula Used:

1) $(a + b + c)^2 = a^2 + b^2 + c^2 + 2(ab + bc + ca)$

2) $a^3 + b^3 + c^3 - 3abc = (a + b + c)(a^2 + b^2 + c^2 - (ab + bc + ca))$

Calculations:

First, find the value of $a^2 + b^2 + c^2$:

=> $(6)^2 = a^2 + b^2 + c^2 + 2(-2)$

=> $36 = a^2 + b^2 + c^2 - 4$

=> $a^2 + b^2 + c^2 = 36 + 4 = 40$

Now, substitute this into the cubic identity:

=> $a^3 + b^3 + c^3 - 3abc = 6 \times (40 - (-2))$

=> $a^3 + b^3 + c^3 - 3abc = 6 \times (40 + 2)$

=> $a^3 + b^3 + c^3 - 3abc = 6 \times 42$

=> $a^3 + b^3 + c^3 - 3abc = 252$

Therefore, the value is 252, which corresponds to Option (4).

Therefore The correct answer is 252.

Additional Information

Conditional Algebraic Identity

If $a + b + c = 0$, then the expression $a^3 + b^3 + c^3 - 3abc$ becomes zero, which implies $a^3 + b^3 + c^3 = 3abc$.

Square of a Trinomial

The expansion of $(a + b + c)^2$ is always $a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$. This is used to find the sum of squares.

Alternative Form of Cubic Identity

$a^3 + b^3 + c^3 - 3abc = 1/2 \times (a + b + c) \times [(a - b)^2 + (b - c)^2 + (c - a)^2]$. This form is useful when differences between variables are given.

Q38. Answer: (d) metals

The correct answer is metals

Key Points

- Elements with 2 electrons in their outermost shell are generally metals.
- These elements are often found in the second group of the periodic table and are known as the alkaline earth metals.
- The common examples include beryllium (Be), magnesium (Mg), calcium (Ca), strontium (Sr), barium (Ba), and radium (Ra).
- Alkaline earth metals are characterized by their shiny appearance and high reactivity.

Additional Information

- Alkaline earth metals have an oxidation state of +2, which is why they readily lose two electrons to form cations.
- These metals are less reactive than alkali metals (group 1) but are still highly reactive, particularly with water and oxygen.
- Due to their reactivity, they are not found in their free elemental state in nature but are commonly found in various minerals.
- Their reactivity increases as you move down the group in the periodic table.
- These metals also have relatively low densities and low melting points compared to other metals.

Q39. Answer: (b) -13 and 2

Shortcut Trick

Identify two numbers that multiply to the constant term −26 and add to the middle coefficient 11.

The numbers are 13 and −2 (since $13 \times -2 = -26$ and $13 - 2 = 11$).

The roots are the values with signs reversed: −13 and 2.

Therefore The correct answer is -13 and 2.

Alternate Method

Given: x2 + 11x − 26 = 0

Formula Used: Factorisation by splitting the middle term.

=> $x2 + 13x - 2x - 26 = 0$

=> $x(x + 13) - 2(x + 13) = 0$

=> $(x + 13)(x - 2) = 0$

=> $x + 13 = 0$ or $x - 2 = 0$

=> $x = -13$ or $x = 2$

Therefore The correct answer is -13 and 2.

Additional Information

Standard Quadratic Equation

A quadratic equation is of the form ax2 + bx + c = 0. The roots can also be found using the formula x = [−b ± √(b2 − 4ac)] / 2a.

Nature of Roots

The value D = b2 − 4ac is called the discriminant. If D > 0, the roots are real and distinct; if D = 0, the roots are real and equal.

Relation between Roots and Coefficients

For the equation ax2 + bx + c = 0, the sum of roots is −b/a and the product of roots is c/a.

Q40. Answer: (c) 10%

Shortcut Trick

Net percentage change formula = a + b + (a × b)/100

Here, a = −40% (decrease) and b = +50% (increase).

Net change = −40 + 50 + [(−40 × 50)/100] = 10 − 20 = −10%.

Negative sign indicates a loss.

Therefore The correct answer is 10%.

Alternate Method

Given: Initial salary decrease = 40%, Subsequent salary increase = 50%.

=> Let the initial salary of Rajiv be 100.

=> After 40% decrease, salary = 100 − 40 = 60.

=> After 50% increase on 60, increase = 60 × (50/100) = 30.

=> Final salary = 60 + 30 = 90.

=> Percentage loss = [(Initial − Final)/Initial] × 100

=> Percentage loss = [(100 − 90)/100] × 100 = 10%.

Therefore The correct answer is 10%.

Additional Information

Successive Percentage Change

When a value is changed by x% and then y% successively, the net change is given by [x + y + (xy/100)]%.

Multiplying Factor Method

Final Value = Initial Value × (1 ± r1/100) × (1 ± r2/100). Use plus for increase and minus for decrease.

Percentage Loss

Loss % = (Amount of Decrease ÷ Original Value) × 100.

Q41. Answer: (d) 3

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

• Numbers that are immediately preceded by a symbol and immediately followed by an even number:

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

Here: < 5 4, ! 4 2, < 3 6

Clearly, there are 'three' numbers immediately preceded by a symbol and immediately followed by an even number.

Hence, the correct answer is "Three".

Q42. Answer: (d) Pankaj Advani

The correct answer is Pankaj Advani

Key Points

• Pankaj Advani has won his eighth title at the 19th Asian 100 UP Billiards Championship, 2022.

• Pankaj Advani is a renowned Indian billiards and snooker player who has won multiple world titles across different formats of both games.

• He is one of the most successful cueists in the history of the sport, with numerous national and international titles to his name.

• Advani's consistent performance has made him a prominent figure in the world of billiards and snooker.

• He has been honored with several awards, including the Padma Bhushan, Padma Shri, and the Rajiv Gandhi Khel Ratna Award.

Additional Information

• The Asian Billiards Championship is an annual event where top billiards players from across Asia compete for the title.

• The championship is governed by the Asian Confederation of Billiard Sports (ACBS), which is responsible for promoting cue

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sports in Asia.

• Billiards is a cue sport that requires precision, strategy, and skill, and has a rich history and tradition in many countries, including India.

• Pankaj Advani's achievements have significantly contributed to the popularity and development of cue sports in India.

Q43. Answer: (b) 19.6

Shortcut Trick

Assume an Assumed Mean (Base) = 20.

Find deviations of each number from 20: −15, −5, +3, +6, and +9.

Sum of deviations = (−15 − 5 + 3 + 6 + 9) = −20 + 18 = −2.

Average deviation = −2 ÷ 5 = −0.4.

Actual Arithmetic Mean = 20 − 0.4 = 19.6.

Therefore The correct answer is 19.6.

Alternate Method

Given: The set of observations = 5, 15, 23, 26, 29.

Formula Used: Arithmetic Mean = (Sum of all observations) ÷ (Total number of observations)

Calculations:

=> Sum of observations = 5 + 15 + 23 + 26 + 29

=> Sum = 98

=> Total number of observations (n) = 5

=> Arithmetic Mean = 98 ÷ 5

=> Arithmetic Mean = 19.6

Therefore The correct answer is 19.6.

Additional Information

Properties of Arithmetic Mean

The sum of the deviations of all items from their arithmetic mean is always zero. If every observation is increased by a constant k, the new mean also increases by k.

Combined Mean Formula

If two groups have sizes n1, n2 and means x1, x2, the Combined Mean = (n1x1 + n2x2) ÷ (n1 + n2).

Weighted Average

When values have different importance, Weighted Mean = $\Sigma w_i x_i \div \Sigma w_i$, where w represents the weight of each observation.

Q44. Answer: (c) Water enters the guard cells and they swell

The correct answer is Water enters the guard cells and they swell

Key Points

• Water enters the guard cells and they swell causing the stomata to open.

• Guard cells are specialized cells located in the epidermis of leaves, stems, and other organs that are used to control gas exchange.

• When water enters the guard cells, they become turgid and the stomatal pore opens.

• This mechanism allows for the uptake of carbon dioxide and the release of oxygen and water vapor during photosynthesis and respiration.

• Conversely, when guard cells lose water, they become flaccid and the stomatal pore closes, reducing water loss through transpiration.

Additional Information

• Guard cells are the only epidermal cells that contain chloroplasts, which are essential for photosynthesis.

• The opening and closing of stomata are influenced by factors such as light, carbon dioxide concentration, and internal water balance.

• Stomatal movement is a critical process in plant physiology, impacting water use efficiency and photosynthetic capacity.

• Regulation of stomatal aperture is crucial for the plant's adaptation to environmental conditions.

• The process is also linked to the plant's internal circadian rhythms, which help optimize gas exchange and water use during different times of the day.

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Q45. Answer: (c) short term

The correct answer is short term

Key Points

• Microfinance in India is a form of financial service which provides small loans and other financial services to poor and low-income households.

• These services are primarily aimed at providing short-term financial assistance, helping individuals to manage immediate needs and stabilize their economic conditions.

• Microfinance institutions (MFIs) offer a range of products including small loans, savings accounts, insurance, and remittance services.

• Loans provided by MFIs are typically of small amounts and have shorter repayment periods compared to traditional bank loans.

• The goal of microfinance is to promote financial inclusion and empower economically disadvantaged individuals by providing them with the necessary financial tools.

Additional Information

• Microfinance has played a significant role in poverty alleviation by providing the poor with access to financial resources that were previously unavailable to them.

• The concept of microfinance gained global recognition through the work of Dr. Muhammad Yunus and the Grameen Bank in Bangladesh, which was awarded the Nobel Peace Prize in 2006.

• In India, microfinance has been supported by various policies and regulatory frameworks to ensure its sustainable growth and positive impact on society.

• Microfinance institutions must adhere to guidelines set by regulatory bodies such as the Reserve Bank of India (RBI) to ensure transparency and protect the interests of borrowers.

Q46. Answer: (a) Only D

Shortcut Trick

A Quadratic Equation is identified when the highest power (degree) of the variable is exactly 2 after full simplification.

Quickly check the highest terms: In A, x^2 cancels out on both sides. In B and C, cubic terms (y^3 and k^3) are generated. In D, the p^3 terms cancel out, leaving a p^2 term.

Therefore The correct answer is Only D.

Alternate Method

We need to simplify each equation to find the degree of the variable.

For Equation A:

$\Rightarrow x(x - 4) = 2x + x^2 - 7$

$\Rightarrow x^2 - 4x = 2x + x^2 - 7$

$\Rightarrow -4x = 2x - 7$ (Subtracting x^2 from both sides)

$\Rightarrow 6x - 7 = 0$ (Linear equation, degree 1)

For Equation B:

$\Rightarrow 5(2y + 3) - 6y = 5y(y^2 - 8y)$

$\Rightarrow 10y + 15 - 6y = 5y^3 - 40y^2$

$\Rightarrow 5y^3 - 40y^2 - 4y - 15 = 0$ (Cubic equation, degree 3)

For Equation C:

$\Rightarrow k(k + 1) - k(k - 2) \times 2k = 0$

$\Rightarrow (k^2 + k) - (k^2 - 2k) \times 2k = 0$

$\Rightarrow k^2 + k - 2k^3 + 4k^2 = 0$

$\Rightarrow -2k^3 + 5k^2 + k = 0$ (Cubic equation, degree 3)

For Equation D:

$\Rightarrow p(p^2 + 7) = p^2 + p^3 - 18$

$\Rightarrow p^3 + 7p = p^2 + p^3 - 18$

$\Rightarrow 7p = p^2 - 18$ (Subtracting p^3 from both sides)

$\Rightarrow p^2 - 7p - 18 = 0$ (Highest power is 2)

Therefore The correct answer is Only D.

Additional Information

Standard Form

A quadratic equation in the variable x is an equation of the form $ax^2 + bx + c = 0$, where a, b, c are real numbers and $a \neq 0$.

Degree of Equation

The degree is the highest exponent of the variable in the polynomial. For quadratic, degree = 2; for cubic, degree = 3; for linear, degree = 1.

Discriminant (D)

The value D = b2 − 4ac determines the nature of roots. If D > 0 (real and distinct), D = 0 (real and equal), D < 0 (imaginary).

Q47. Answer: (b) 8^(th)

The logic followed here is:

Total number of students in the class = 17

A's rank from the top = 9th

B's rank from the bottom = 11th

To find B's rank from the top, we subtract B's rank from the bottom from the total number of students and add 1:

B's rank from the top = 17 - 11 + 1 = 7th

C's rank is better than A's but worse than B's. Hence, C's rank from the top must be between A's and B's ranks.

So, C's rank from the top = 8th

Hence, the correct answer is "Option 2".

Q48. Answer: (a) Onam

The correct answer is Onam

Key Points

• Onam is the main harvest festival celebrated in South India, particularly in the state of Kerala.

• It marks the homecoming of the mythical King Mahabali and is celebrated with much fervor and enthusiasm.

• The festival includes various cultural events, traditional games, music, dance, and the famous boat races.

• Onam is traditionally observed with elaborate feasts, known as Onam Sadhya, which consist of a variety of dishes served on a banana leaf.

Additional Information

• Uttarayan, also known as Makar Sankranti, is a festival celebrated in Gujarat and other parts of India, marking the transition of the sun into the zodiac sign of Capricorn.

• Bihu is the main harvest festival celebrated in Assam, consisting of three different Bihu festivals in a year: Rongali Bihu, Kongali Bihu, and Bhogali Bihu.

• Maghi is a harvest festival celebrated in Punjab, marking the start of the month of Magh in the Hindu calendar.

• Onam is unique to Kerala and is not just a harvest festival but also a celebration of the cultural heritage of the region.

Q49. Answer: (b) 500/9 m/sec

Shortcut Trick

Total distance = 12,800 − 12,000 = 800 km

Average speed in km/hr = 800 ÷ 4 = 200 km/hr

To convert km/hr to m/sec, multiply by 5/18: 200 × (5/18) = 1000/18 = 500/9 m/sec

Therefore The correct answer is 500/9 m/sec.

Alternate Method

Given: Initial reading = 12,000 km, Final reading = 12,800 km, Total time = 4 hours.

Formula Used: Average Speed = Total Distance ÷ Total Time

=> Total Distance = Final Reading − Initial Reading

=> Total Distance = 12,800 km − 12,000 km = 800 km

=> Average Speed (km/hr) = 800 ÷ 4 = 200 km/hr

=> Conversion factor: 1 km/hr = 5/18 m/sec

=> Average Speed (m/sec) = 200 × (5 ÷ 18)

=> Average Speed (m/sec) = 1000 ÷ 18 = 500/9 m/sec

Therefore The correct answer is 500/9 m/sec.

Additional Information

Speed Conversion Rules

To convert km/hr to m/sec, multiply by 5/18. To convert m/sec to km/hr, multiply by 18/5.

Average Speed Formula

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Average speed is defined as the total distance traveled divided by the total time taken (Total Distance ÷ Total Time).

Odometer

An odometer or odograph is an instrument used for measuring the distance traveled by a vehicle.

Q50. Answer: (d) ILUGVMF

FEELING: VVUOTMR

HEAVILY: ZVSEBOR

Similarly,

FORTUNE: ?

Hence, the correct answer is "ILUGVMF".

Q51. Answer: (d) Only conclusion I follows

Given,

Statement:

Onion prices have skyrocketed due to shortage of onions and largescale hoarding by a few traders.

Conclusions:

I. The government must crackdown on the hoarders and impose stringent penalties on hoarders - True (Because, the statement indicates that hoarding by a few traders is one of the reasons for the skyrocketing prices of onions, which suggests that action against hoarders could address the issue).

II. People must stop eating onions and switch to potatoes instead - False (Because, the statement does not provide any basis to conclude that people should change their eating habits).

So, Only conclusion I follows.

Hence, the correct answer is "Option 4".

Q52. Answer: (c) 1971

The logic followed here is:

Hence, the correct answer is "1971".

Q53. Answer: (b) West

According to the given information,

1) T is 40 m to the east of Q. P is 30 m to the south of Q.

2) R is 40 m to the west of Q. Q is 35 m to the south of S.

Here, we can see that R is in west direction with reference to T.

Hence, the correct answer is "West".

Q54. Answer: (c) violet

The correct answer is violet

Key Points

• Violet light has the maximum refractive index among the components of white light.

• The refractive index of a medium depends on the wavelength of the light passing through it.

• Shorter wavelengths of light, such as violet, are refracted more than longer wavelengths like red when passing through a medium.

• This phenomenon is why violet light bends more and has a higher refractive index compared to other colors in the visible spectrum.

Additional Information

• The refractive index is a measure of how much the speed of light is reduced inside a medium compared to its speed in a vacuum.

• The refractive index is given by the formula n = c/v, where c is the speed of light in a vacuum and v is the speed of light in the medium.

• Light of different wavelengths travels at different speeds in a medium, leading to dispersion and the separation of white light into its constituent colors.

• This principle is utilized in prisms and lenses to create various optical effects.

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Q55. Answer: (a) E

Given: Six boxes A, B, C, D, E, and F are kept one over the other, but not necessarily in the same order.

1) Only one box is kept between B and D.

B/D
B/D

2) Only two boxes are kept between B and E.

B/E
B/E

3) E is kept just above A.

Condition 1:

E
A
B

Condition 2:

B
E
A

4) F is kept just above B.

Condition 1:

E
A
F
B

Condition 2:

F
B
E
A

5) Box A is not kept in the bottom-most position.

So, Condtion 2 is not fulfill this statement condition.

E
A

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F
B

From statement 1, Only one box is kept between B and D.

E
A
F
B
D

Only C is remaining,

E
A
F
B
C
D

So, 'E' box is kept at the top.

Hence, the correct answer is "Option 1".

Q56. Answer: (c) It reduces

The correct answer is It reduces

Key Points

• It reduces is the correct option regarding th20e effect of addition of water on the concentration of hydroxide ions.

• When water is added to lemon juice, the solution becomes more diluted.

• This dilution decreases the concentration of all ions present, including hydroxide ions.

• The sourness of lemon juice is due to the presence of citric acid, and adding water reduces the concentration of citric acid as well, making it less sour.

Additional Information

• The concentration of hydroxide ions is inversely proportional to the dilution of the acidic solution.

• Adding water to any acidic or basic solution will decrease the concentration of the ions responsible for its pH.

• In the case of lemon juice, which is acidic, adding water will lower the concentration of hydrogen ions (H^+) and hydroxide ions (OH^-).

Q57. Answer: (b) DHEL : WSVO

The logic followed here is:

Logic: The letters are coded with the opposite letters as per the positional value table.

KDRB: PWIY

UNCG: FMXT

Now, let's check each option,

1) FTZN: UGVW

2) DHEL: WSVO

=> Follows the logic.

3) VQCX: EPXZ

4) TNDK: GMRP

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

Hence, the correct answer is "DHEL: WSVO".

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Q58. Answer: (c) Rs. 13,632

Calculation:

Money spends on ration is 36%.

Money spends on Rent is 20%.

Difference = 36% - 20% = 16%

According to the question.

16% of 85,200 = Rs. 13,632

Therefore Option 3 is the correct answer.

Q59. Answer: (c) Gandak

The correct answer is Gandak

Key Points

• Gandak is not a tributary of the Brahmaputra River.

• Gandak is a major river in Nepal and India, which is a tributary of the Ganges River, not the Brahmaputra.

• The main tributaries of the Brahmaputra River include Subansiri, Lohit, and Manas among others.

• The Brahmaputra River flows through Tibet, India, and Bangladesh, playing a crucial role in the river systems of these regions.

Additional Information

• The Brahmaputra River originates from the Angsi Glacier in the Himalayas in Tibet and flows through India and Bangladesh before emptying into the Bay of Bengal.

• It is known as the Yarlung Tsangpo in Tibet and the Jamuna in Bangladesh.

• The river is known for its strong currents and seasonal flooding, which play a significant role in the agriculture and ecology of the regions it flows through.

• The Brahmaputra River basin supports diverse ecosystems and is home to numerous species of flora and fauna.

Q60. Answer: (c) 1

Given word: 'QUALITY'

After arranged in alphabetical order:

Alphabets	Q	U	A	L	I	T	Y
Alphabetical order	A	I	L	Q	T	U	Y

After arranged in alphabetical order,

The letters that remain in their original positions are:

Last alphabet from the left end is: Y

Hence, the correct answer is "Option 3".

Q61. Answer: (b) 14.28%

Shortcut Trick

Profit% for a dishonest dealer selling at cost price is calculated as:

Profit% = (Error ÷ True Value − Error) × 100

Profit% = (False Weight Given ÷ Actual Weight Sold) is also expressed as (Weight Gap ÷ Weight Actually Given) × 100.

Here, for every 40 kg (True Value), he gives only 35 kg.

Profit% = (5 ÷ 35) × 100 = (1 ÷ 7) × 100 = 14.28%.

Therefore The correct answer is 14.28%.

Alternate Method

Given: Total weight promised = 40 kg, Weight actually given = 35 kg, Selling Price (SP) = Cost Price (CP) per unit.

Formulas: Profit% = (Profit ÷ CP) × 100 | Total CP = Weight given × CP per kg | Total SP = Weight promised × CP per kg.

=> Let the CP of 1 kg sugar be 1 unit.

=> The shopkeeper delivers 35 kg, so his Total CP = 35 units.

=> He charges the customer for 40 kg at CP, so his Total SP = 40 units.

=> Profit = SP − CP = 40 − 35 = 5 units.

=> Profit% = (5 ÷ 35) × 100 = 14.2857...

Therefore The correct answer is 14.28%.

Additional Information

Dishonest Dealer Concept

When a dealer claims to sell at CP but uses false weights, the profit is always calculated on the actual quantity delivered to the customer.

Effective Profit with Markup

If a dealer marks up the price by x% and also uses y% less weight, the overall profit is compounded using the ratio method.

Q62. Answer: (a) 72

The logic followed here is:

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

Now,

For, 4 : 8

=> 4 × (4 ÷ 2) = 4 × 2 = 8.

For, 8 : 32

=> 8 × (8 ÷ 2) = 8 × 4 = 32.

Similarly, for 12 : ?

=> (12 × (12 ÷ 2) = 12 × 6 = 72.

Hence, the correct answer is "Option 1".

Q63. Answer: (c) Temperature

The correct answer is Temperature

Key Points

• Temperature determines the sex of fertilised eggs in a few reptiles.

• This phenomenon is known as temperature-dependent sex determination (TSD).

• In some reptiles, such as certain species of turtles, crocodilians, and lizards, the ambient temperature during a critical period of embryonic development determines whether the offspring will be male or female.

• This is different from the genetic sex determination seen in many other animals, where sex is determined by specific chromosomes (allosomes).

• For example, in many turtle species, higher incubation temperatures produce females, while lower temperatures produce males.

Additional Information

• Temperature-dependent sex determination (TSD) is a type of environmental sex determination, where the environment plays a crucial role in determining the sex of the offspring.

• This mechanism allows for the adjustment of sex ratios in response to environmental conditions, potentially providing an evolutionary advantage.

• Research into TSD can help in the conservation of endangered reptile species, as understanding the temperature ranges that produce both sexes can inform breeding programs.

• In contrast, in genetic sex determination systems, such as those in humans, sex is determined at fertilization by the combination of sex chromosomes (XX for females and XY for males).

Q64. Answer: (c) Shahnaz

Given: Six girls Natasha, Yuvika, Aditi, Tanya, Shahnaz, and Daljeet are comparing their heights.

No two girls are of the same height.

1) Aditi is taller than only Natasha and one other girl.

> > Aditi > > Natasha

2) Shahnaz is shorter than Daljeet, who is shorter than Yuvika.

Yuvika > Daljeet > Shahnaz

Combining the information:

From the first statement, since Aditi is taller than Natasha and one other girl, Aditi must be the fourth tallest.

From the second statement, the order among Yuvika, Daljeet, and Shahnaz is clear.

Thus, the height order is:

Yuvika > Daljeet > Shahnaz > Aditi > __ > Natasha

Since Aditi is the fourth tallest and there are only one girl left, Tanya must be the one taller than Natasha but shorter than Aditi.

So the final order is:

Yuvika > Daljeet > Shahnaz > Aditi > Tanya > Natasha

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Therefore, the third tallest girl is Shahnaz.
Hence, the correct answer is "Option 3".

Q65. Answer: (a) Rs. 63,960

Shortcut Trick
Total Area to be painted = Lateral Surface Area + Area of Ceiling.
Total Area = 2H(L + B) + (L × B)
Total Area = 2 × 21 × (15 + 17) + (15 × 17) = 42 × 32 + 255 = 1344 + 255 = 1599 m².
Total Cost = 1599 × 40 = Rs. 63,960.
Therefore The correct answer is Rs. 63,960.
Alternate Method
Given:
Length (L) = 15 m
Breadth (B) = 17 m
Height (H) = 21 m
Rate = Rs. 40/m²
Formula Used:
Area of four walls = 2 × Height × (Length + Breadth)
Area of ceiling = Length × Breadth
Calculations:
=> Area of 4 walls = 2 × 21 × (15 + 17)
=> Area of 4 walls = 42 × 32 = 1344 m²
=> Area of ceiling = 15 × 17 = 255 m²
=> Total Area to be painted = 1344 + 255 = 1599 m²
=> Total Cost = 1599 × 40
=> Total Cost = Rs. 63,960
Therefore The correct answer is Rs. 63,960.
Additional Information
Total Surface Area of Cuboid
The total surface area includes all six faces: 2(LB + BH + HL).
Volume of Cuboid
The capacity or space occupied by the room: V = L × B × H.
Diagonal of Cuboid
The longest rod that can be placed in the room: D = √(L² + B² + H²).

Q66. Answer: (a) 252

The logic followed here is:
Logic: (1st number × 12) = 2nd number.
Now,
For, 15 : 180
=> 15 × 12 = 180.
For, 17 : 204
=> 17 × 12 = 204.
Similarly, for 21 : ?
=> 21 × 12 = 252.
Hence, the correct answer is "Option 1".

Q67. Answer: (a) 900

The correct answer is 900
Key Points
• The power consumption of the electric heater per day is 1000 W * 5 hours = 5000 Wh or 5 kWh.
• There are 30 days in the month of September.
• Total energy consumption for the month = 5 kWh/day * 30 days = 150 kWh.

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• The cost per unit (kWh) is Rs. 6.00.
• Total cost = 150 kWh * Rs. 6.00/kWh = Rs. 900.
Additional Information
• Electric heaters are typically used for heating spaces and can consume a significant amount of electricity.
• It's important to consider the cost of running high-power devices for extended periods to manage electricity bills effectively.
• Using energy-efficient devices or limiting usage can help reduce electricity consumption and costs.
• Regular maintenance of electrical appliances can also improve their efficiency and reduce energy consumption.

Q68. Answer: (b) Only conclusion I follows

Given Statements:
I. Some lions are cats.
II. All cats are animals.
III. Some animals are not lions.
The least possible Venn diagram for the given statement is:
Conclusions:
I. Some animals are lions - True (Because, Some lions are cats and all cats are animals, so some lions are animals).
II. All lions are animals - False (Because, It may be possible but not defined).
III. No animal is a lion - False (Because, Some lions are cats and all cats are animals, so some animals are lions).
So, Only conclusion I follows.
Hence, the correct answer is "Option 2".

Q69. Answer: (d) 3055.75

Given:
47/9×78/9×81+23/4
=> 43/9×71/9×81+23/4
=> 43×71+11/4
=> 3053 + 2.75
=> 3055.75
Therefore Option 4 is the correct answer.

Q70. Answer: (d) 13 cm

Shortcut Trick
Ratio of adjacent sides = 3 : 2
Sum of ratio parts = 3 + 2 = 5
Perimeter = 2 × (Sum of adjacent sides) => 65 = 2 × (5 units)
10 units = 65 cm => 1 unit = 6.5 cm
Shorter side (2 units) = 2 × 6.5 = 13 cm
Therefore The correct answer is 13 cm.
Alternate Method
Given: Ratio of adjacent sides = 3 : 2, Perimeter = 65 cm
Formula: Perimeter of Parallelogram = 2(a + b), where a and b are adjacent sides.
=> Let the adjacent sides be 3x and 2x.
=> Perimeter = 2(3x + 2x)
=> 65 = 2(5x)
=> 65 = 10x
=> x = 65 ÷ 10 = 6.5
=> Length of shorter side = 2x = 2 × 6.5
=> Shorter side = 13 cm
Therefore The correct answer is 13 cm.
Additional Information
Parallelogram Properties
Opposite sides are equal and parallel. Opposite angles are also equal.
Area of Parallelogram

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Area = Base × Height. If adjacent sides a, b and angle θ are given, Area = ab sinθ.

Diagonal Property

The diagonals of a parallelogram bisect each other. Sum of squares of diagonals = $2(a^2 + b^2)$.

Q71. Answer: (a) 4.7

The correct answer is 1) 4.7

Key Points

• Bharti Airtel has signed an agreement to buy 4.7% of Vodafone's stake in Indus Towers.

• This acquisition will strengthen Airtel's position in the telecom infrastructure sector.

• Indus Towers is one of the largest telecom tower companies in India, providing shared telecom infrastructure to telecom operators.

• The move is seen as part of Bharti Airtel's strategy to consolidate its holdings and enhance its operational capabilities.

Additional Information

• Indus Towers was formed as a joint venture between Bharti Infratel, Vodafone India, and Aditya Birla Telecom.

• The company provides passive infrastructure services to all telecom operators in India.

• With this acquisition, Bharti Airtel aims to optimize its network and enhance service quality for its customers.

• The telecom sector in India is witnessing significant consolidation and strategic partnerships to improve competitiveness and service delivery.

Q72. Answer: (b) O > P

Given Statement: X < Z = T > V > P < Y = O

Now,

Conclusions:

Option 1: T > Y → False (T > V > P < Y It gives T > V > P < Y, but no direct relation between T and Y)

Option 2: O > P → True (P < Y = O It gives O > P)

Option 3: T < X → False (X < Z = T It gives X < T)

Option 4: V > Y → False (V > P < Y It gives V > P < Y, but no direct relation between V and Y)

Hence, the correct answer is "Option 2".

Q73. Answer: (c) 4,725

Shortcut Trick

Given Cost Price (CP) = 4,500 and Gain% = 5%.

Using multiplier method: Selling Price (SP) = CP × (100 + Gain%) ÷ 100.

SP = 4,500 × (105 ÷ 100) = 4,500 × 1.05.

SP = 4,725.

Therefore The correct answer is Rs. 4,725.

Alternate Method

Given: CP = Rs. 4,500, Gain% = 5%.

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

=> Profit = (5 × 4,500) ÷ 100 = 5 × 45 = 225.

=> Selling Price (SP) = 4,500 + 225 = 4,725.

Therefore The correct answer is Rs. 4,725.

Additional Information

Profit and Loss Basics

Profit occurs when Selling Price (SP) is greater than Cost Price (CP). Profit = SP − CP.

Profit Percentage

It is always calculated on the Cost Price unless stated otherwise. Profit% = (Profit ÷ CP) × 100.

Q74. Answer: (d) Rule of Law

The correct answer is Rule of Law

Key Points

• The principle of Rule of Law asserts that the laws apply equally to all individuals, regardless of their status.

• This principle ensures that no one is above the law, and everyone is subject to the same legal standards.

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• It is a fundamental aspect of democratic governance and is essential for maintaining justice and equality in society.

• The Rule of Law promotes transparency, accountability, and fairness within the legal and judicial systems.

• It is a cornerstone of modern legal systems and is crucial for the protection of human rights and the prevention of arbitrary use of power.

Additional Information

• The concept of the Rule of Law dates back to ancient civilizations and has been a central theme in legal and political philosophy.

• It is often contrasted with the "Rule of Man," where decisions are made based on the whims of individuals rather than established laws.

• Modern interpretations of the Rule of Law include principles such as legal certainty, procedural transparency, and the protection of fundamental rights.

• International organizations, such as the United Nations, advocate for the Rule of Law as a means to achieve sustainable development and peace.

• Many countries have enshrined the Rule of Law in their constitutions and legal frameworks to ensure governance based on justice and equality.

Q75. Answer: (a) 250

The correct answer is 250

Key Points

• 250 is the maximum strength of the Rajya Sabha as per Article 80 of the Constitution of India.

• The Rajya Sabha, also known as the Council of States, is the upper house of India's bicameral Parliament.

• Out of the total 250 members, 238 members are elected by the legislatures of the states and union territories using a single transferable vote system, while the President of India nominates 12 members for their contributions to art, literature, science, and social services.

• The Rajya Sabha is a permanent body and is not subject to dissolution, but one-third of its members retire every two years.

• The Vice President of India is the ex-officio Chairman of the Rajya Sabha.

Additional Information

• The Constitution of India was adopted by the Constituent Assembly on 26th November 1949 and came into effect on 26th January 1950.

• It lays down the framework defining fundamental political principles, establishes the structure, procedures, powers, and duties of government institutions, and sets out fundamental rights, directive principles, and the duties of citizens.

• The Constitution of India is the longest written constitution of any country in the world.

• It declares India a sovereign, socialist, secular, and democratic republic, assuring its citizens justice, equality, and liberty, and endeavors to promote fraternity.

• The Parliament of India consists of two houses: the Rajya Sabha (Council of States) and the Lok Sabha (House of the People).

• The Rajya Sabha plays a crucial role in the legislative process, including the review and passage of bills, and serves as a forum for representing the states of India.

Q76. Answer: (a) I

According to the given arrangement,

1) I was second to the left of K.

2) I was to the immediate left of G.

3) There were exactly two girls between J and G.

4) K was to the immediate left of H.

Here, we can see that 'I' is sitting to the immediate right of L.

Hence, the correct answer is "I".

Q77. Answer: (d) Only conclusions I and II follow

Given Statements:

All gifts are letters.

All letters are chats.

All words are gifts.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some chats are words - True (Because, all words are gifts, and all gifts are letters, and all letters are chats, so some chats are words).

II. All gifts are chats - True (Because, all gifts are letters, and all letters are chats, so all gifts are chats).

III. Some words are not letters - False (Because, all words are gifts, and all gifts are letters, so some words are not letters cannot be true).

So, Only conclusions I and II follow.

Hence, the correct answer is "Option 4".

Q78. Answer: (a) Platelets

The correct answer is Platelets

Key Points

• Platelets are the blood components primarily responsible for the formation of clots.

• They are small, disc-shaped cell fragments that circulate in the bloodstream and are essential for normal blood clotting.

• When a blood vessel is injured, platelets adhere to the site of injury, aggregate together, and form a plug to help stop the bleeding.

• This process is known as hemostasis, which is crucial for preventing excessive blood loss.

Additional Information

• In addition to platelets, plasma proteins like fibrinogen also play a significant role in the clotting process by forming a mesh that traps blood cells.

• White blood cells are part of the immune system and help fight infections but are not involved in clot formation.

• Red blood cells carry oxygen throughout the body but do not contribute to clotting.

• Maintaining a proper balance of platelets is vital; too few can lead to excessive bleeding, while too many can cause abnormal clotting, leading to conditions such as thrombosis.

Q79. Answer: (b) 80

Given:

12.999 - 3.998 + 14.002 × 3.998 + 27.008 ÷ 3.001 + 35.999 ÷ 5.998 = ?

Concept used:

Calculation:

=> 12.999 - 3.998 + 14.002 × 3.998 + 27.008 ÷ 3.001 + 35.999 ÷ 5.998 = ?

=> 13 - 4 + 14 × 4 + 27 ÷ 3 + 36 ÷ 6

=> 9 + 56 + 9 + 6

=> 80

Therefore Option 2 is the correct answer.

Q80. Answer: (a) 32Q

The logic followed here is:

Hence, the correct answer is "32Q".

Q81. Answer: (a) Rs. 8,920

Shortcut Trick

In Compound Interest, if time intervals are equal (0 to 3 years and 3 to 6 years), the amounts are in Geometric Progression (G.P.).

Common ratio (k) = Amount2 ÷ Amount1 = 20,070 ÷ 13,380 = 1.5

Principal (P) = Amount1 ÷ k

P = 13,380 ÷ 1.5 = 8,920

Therefore The correct answer is Rs. 8,920.

Alternate Method

Given:

Amount after 3 years (A1) = Rs. 13,380

Amount after 6 years (A2) = Rs. 20,070

Formula Used:

$A = P(1 + r/100)^n$

Calculations:

=> $13,380 = P(1 + r/100)^3$ --- (i)

=> 20,070 = P(1 + r/100)^6 --- (ii)

Divide equation (ii) by (i):

=> $(1 + r/100)^3 = 20,070 \div 13,380$

=> $(1 + r/100)^3 = 2,007 \div 1,338 = 3/2$

Substitute the value of $(1 + r/100)^3$ in equation (i):

=> $13,380 = P \times (3/2)$

=> $P = (13,380 \times 2) \div 3$

=> $P = 4,460 \times 2$

=> $P = 8,920$

Therefore The correct answer is Rs. 8,920.

Additional Information

Constant Growth Property

In Compound Interest, the amount increases by a constant factor over equal intervals of time. If A1 is the amount after t years and A2 is the amount after 2t years, then $P = (A1)^2 \div A2$.

CI vs SI Difference (2 Years)

The difference (D) between Compound Interest and Simple Interest for 2 years at rate r% is given by $D = P(r/100)^2$.

Effective Rate of Interest

When interest is compounded half-yearly, the effective annual rate is $[(1 + r/200)^2 - 1] \times 100\%$.

Q82. Answer: (c) 6 Ω

The correct answer is 6 Ω.

Key Points

• For resistors in series, equivalent resistance adds directly: R_(eq) = R1 + R2.
• Substituting the values: R_(eq) = 2 Ω + 4 Ω = 6 Ω.
• In a series circuit, the same current flows through each resistor, so adding resistance increases total opposition to current.
• The result 6 Ω corresponds to Option 3, which is larger than each individual resistance, as expected for series connections.

Additional Information

• Resistance (R)
• Measures how strongly a component opposes electric current.
• Unit is the ohm denoted by the Greek letter Ω.
• Depends on material resistivity, length, and cross-sectional area of the conductor.
• Measured using an ohmmeter or via V and I using Ohm's law.
• Series Connection
• Components are connected end to end, forming a single path for current.
• Current is the same through all elements; voltages divide across them.
• Total or equivalent resistance is the sum of individual resistances.
• Characteristic check: R_(eq) is always greater than any individual series resistor.
• Equivalent Resistance
• A single resistance that can replace a combination with the same V–I behavior at its terminals.
• For series: R_(eq) = R1 + R2 + R3 + …
• Contrast with parallel: 1/R_(eq) = 1/R1 + 1/R2 + …, where R_(eq) is less than the smallest branch.
• Useful for simplifying networks before applying circuit laws.
• Ohm's Law and Voltage Drops
• Ohm's law: V = I R, relates voltage, current, and resistance.
• In series, with current I, each drop is V_k = I R_k; the source voltage equals the sum of drops.
• Example check: if a 12 V source drives 2 Ω and 4 Ω in series, R_(eq) = 6 Ω, so I = 12/6 = 2 A; drops are 4 V and 8 V.
• This verifies both the arithmetic and the distribution of voltages in series circuits.
• Power Considerations
• Power dissipated: $P = I^2R = V^2/R = V I$.
• In series, the higher resistance dissipates more power for the same current.
• For the example above at 2 A: P_(2Ω) = 8 W, P_(4Ω) = 16 W, total 24 W equals source power.
• Ensures component ratings are not exceeded during operation.

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Q83. Answer: (a) Bauxite

The correct answer is Bauxite

Key Points

• The districts of Koraput, Rayagada, Kalahandi, and Balangir in Odisha are famous for bauxite mining.

• Bauxite is the principal ore of aluminum and is used in the production of various aluminum products.

• These districts have rich bauxite deposits, which are extensively mined and contribute significantly to Odisha's economy.

• The mining activities in these regions have also led to the development of related industries and employment opportunities.

Additional Information

• Odisha is one of the leading states in India in terms of bauxite production.

• Bauxite mining in Odisha is regulated by various state and central government agencies to ensure sustainable mining practices.

• The mined bauxite is processed in nearby aluminum plants to produce alumina and aluminum.

• Efforts are being made to balance the economic benefits of bauxite mining with environmental conservation and the well-being of local communities.

Q84. Answer: (a) Vacuoles

The correct answer is Vacuoles

Key Points

• Vacuoles are membrane-bound organelles found in plant cells.

• They are primarily used to store waste material, nutrients, and other substances that the cell might need to survive.

• In addition to storage, vacuoles also help maintain the cell's turgor pressure, which is essential for maintaining the plant's structure and rigidity.

• Vacuoles can occupy a significant portion of the cell's volume, especially in mature plant cells.

Additional Information

• Plastids are involved in photosynthesis and storage of starches, lipids, and proteins.

• Lysosomes contain digestive enzymes to break down waste materials and cellular debris.

• Nucleus houses the cell's genetic material and controls cellular activities.

• While vacuoles are prominent in plant cells, animal cells may have small, temporary vacuoles.

Q85. Answer: (b) both b and d

Shortcut Trick

For two triangles to be similar, they must have the same shape but can have different sizes.

The core mathematical conditions for similarity are:

1. Corresponding angles must be equal (Condition d).

2. Corresponding sides must be in the same ratio or proportional (Condition b).

Condition a refers to isosceles properties, and while c (AA criterion) is sufficient to prove similarity, b and d constitute the primary definition.

Therefore The correct answer is both b and d.

Alternate Method

Given: Properties of similar triangles.

Formula Used: Two triangles are similar if they satisfy the AAA (Angle-Angle-Angle) or SSS (Side-Side-Side) similarity criteria.

=> In the diagram, ΔABC and ΔEDF are similar because their corresponding angles are equal (both have a 90° angle and same base angles).

=> Their corresponding sides are proportional: EF/BC = 6/3 = 2 and FD/CA = 8/4 = 2.

=> Statement (b) refers to the proportionality of sides, which is a necessary condition.

=> Statement (d) refers to the equality of angles, which is the primary defining condition.

=> Thus, both conditions (b) and (d) correctly identify similar triangles.

Therefore The correct answer is both b and d.

Additional Information

AA Similarity Criterion

If two angles of one triangle are equal to two angles of another triangle, then the triangles are similar (the third angle is automatically equal due to the angle sum property).

SAS Similarity Criterion

Two triangles are similar if one angle is equal to the corresponding angle and the sides including these angles are proportional.

Area of Similar Triangles

The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides: Area(Δ1)/Area(Δ2) = (s1/s2)².

Q86. Answer: (d) electromagnetic induction

The correct answer is electromagnetic induction

Key Points

• Electromagnetic induction is the phenomenon due to which the relative motion between a conductor and a magnet produces a potential difference across the conductor.

• This principle was discovered by Michael Faraday in 1831.

• It forms the working basis of many electrical devices such as transformers, electric generators, and inductors.

• The induced potential difference or voltage is generated due to the changing magnetic field around the conductor.

Additional Information

• Michael Faraday's experiments showed that a change in the magnetic field within a closed loop of wire induces an electric current in the wire.

• The direction of the induced current is given by Lenz's Law, which states that the induced current will flow in such a direction that it will oppose the change in magnetic flux that produced it.

• The magnitude of the induced electromotive force (EMF) is given by Faraday's Law of Induction, which states that the EMF induced is proportional to the rate of change of magnetic flux.

• Applications of electromagnetic induction include electric power generation, induction cooking, wireless power transfer, and electromagnetic braking.

Q87. Answer: (c) 44

The logic follows here is:

The hands of a clock are in a straight line but opposite in directions 11 times in 12 hours.

So, in 48 hours, both the hands of a clock are in a straight line but opposite in directions 11 × 4 = 44 times in 48 hours.

Hence, the correct answer is "Option 3".

Q88. Answer: (a) Toyota Kirloskar Motor Pvt. Ltd.

The correct answer is Toyota Kirloskar Motor Pvt. Ltd.

Key Points

• On 16 March 2022, the Union Ministry for Road Transport and Highways inaugurated a pilot project for hydrogen-based advanced Fuel Cell Electric Vehicle (FCEV).

• This pilot project was initiated by Toyota Kirloskar Motor Pvt. Ltd..

• The project aims to explore and promote hydrogen as an alternative fuel in India.

• FCEVs are powered by hydrogen and produce zero emissions, contributing to a cleaner environment.

Additional Information

• Hydrogen Fuel Cell Electric Vehicles (FCEVs) use chemical reactions between hydrogen and oxygen to generate electricity, which powers the vehicle's electric motor.

• Toyota is a global leader in the development of hydrogen fuel cell technology, with its flagship FCEV model being the Toyota Mirai.

• India is exploring hydrogen as a viable alternative to fossil fuels to reduce its carbon footprint and dependence on imported oil.

• The success of such pilot projects could pave the way for wider adoption of hydrogen technology in the Indian automotive sector.

Q89. Answer: (d) PK Thungon Committee

The correct answer is PK Thungon Committee

Key Points

• The PK Thungon Committee recommended constitutional recognition for local government bodies in 1989.

• This recommendation played a crucial role in the eventual passing of the 73rd and 74th Constitutional Amendments in 1992, which aimed to strengthen and recognize the role of local self-governments in India.

• The 73rd Amendment relates to the establishment and empowerment of Panchayats (rural local governments), while the 74th Amendment focuses on Municipalities (urban local governments).

• These amendments introduced provisions for regular elections, reservations for marginalized sections, and greater financial autonomy for local bodies.

• The reforms were essential to promote decentralized governance and ensure effective participation of people at the grassroots

level in the democratic process.

Additional Information

• The 73rd and 74th Constitutional Amendments were enacted during the tenure of Prime Minister P. V. Narasimha Rao.

• These amendments added Part IX and Part IXA to the Constitution, which specifically deal with Panchayats and Municipalities, respectively.

• They also introduced Schedules XI and XII, which enumerate the powers, authority, and responsibilities of Panchayats and Municipalities.

• The objective was to create a more inclusive and participatory form of governance by involving local communities in decision-making processes.

• These amendments have been instrumental in promoting decentralization, accountability, and transparency in local governance.

Q90. Answer: (c) Hindbrain

The correct answer is Hindbrain.

Key Points

• Functions of hindbrain

• It is responsible for controlling the lungs as well as the heart. It also controls heart rate, breathing, blood pressure, sneezing, and swallowing.

• The cerebellum helps in coordinating the various muscles that enable the voluntary movements we make.

• The cranial nerves in the medulla oblongata also have many functions.

Additional Information

• Human brain:

• On average, an adult brain weighs between 1.0 kg - 1.5 kg. It is mainly composed of neurons – the fundamental unit of the brain and nervous system.

• Parts of Human Brain:

• Forebrain – Largest part of the brain

• It is the anterior part of the brain. The forebrain parts include:

• Cerebrum

• Hypothalamus

• Thalamus

• Forebrain Function: Controls the reproductive functions, body temperature, emotions, hunger, and sleep.

• Midbrain: Smallest and central part of the brain

• The midbrain consists of:

• Tectum

• Tegmentum

• Hindbrain: The lower part of the brain

• Cerebellum

• Medulla

• Pons

Q91. Answer: (a) 135°, anticlockwise

According to the given information,

1) Kalpit is standing in a park facing the south direction. Then, he takes two consecutive clockwise turns of 45° each.

2) Then, he takes a third turn of some degrees after which he is now facing the south-east direction.

Here, we can see that he took a turn of 135° in anticlockwise direction.

Hence, the correct answer is "135°, anticlockwise".

Q92. Answer: (b) a, b, e and f

The correct answer is 2 Only.

Key Points

Factors Contributing to Forest Conservation:

• Regulated and planned cutting of trees: This involves the careful planning and management of tree cutting to ensure that the forest can regenerate and maintain its ecological balance. This practice helps in preventing deforestation and promoting sustainable use of forest resources.

• Control over forest fire: Implementing measures to prevent and control forest fires is crucial for conserving forests. Forest fires

can cause massive destruction of flora and fauna, and controlling them helps in preserving the forest ecosystem.

• Promotion of afforestation and reforestation: Afforestation refers to planting trees in areas that were not previously forested, while reforestation involves replanting trees in deforested areas. Both practices are essential for increasing forest cover and restoring degraded lands.

• Proper utilisation of forest and forests products: Ensuring that forest products are used efficiently and sustainably helps in reducing wastage and over-exploitation of forest resources. This includes practices like sustainable logging, non-timber forest product harvesting, and promoting eco-friendly alternatives.

By implementing these measures, forests can be conserved effectively. Practices like monoculture planting, construction of roads in the forest, and clearing land for cattle grazing are not conducive to forest conservation and can lead to habitat destruction and loss of biodiversity.

Q93. Answer: (a) concave, plane, convex

The correct answer is option 1

Key Points

• The boy's head appears enlarged, indicating the use of a concave mirror at the top.

• The body appears of the same size, indicating the use of a plane mirror in the middle.

• The legs appear smaller, indicating the use of a convex mirror at the bottom.

• Thus, the correct arrangement of mirrors from top to bottom is concave, plane, convex.

Additional Information

• Concave mirrors converge light and can produce magnified images when the object is placed close to the mirror.

• Plane mirrors reflect light without altering the size of the image.

• Convex mirrors diverge light and can produce diminished images of objects.

• These properties of mirrors are utilized in various applications, including in magic mirrors to create interesting visual effects.

Q94. Answer: (d) King Nandivardhan

The correct answer is King Nandivardhan

Key Points

• King Nandivardhan is credited with the construction of the Jal Mandir related to Jainism.

• The Jal Mandir is a significant Jain temple located in Pawapuri, Bihar.

• It is said to mark the place where Lord Mahavira, the 24th Tirthankara of Jainism, attained Nirvana.

• The temple is situated in the middle of a lotus pond and is an important pilgrimage site for Jains.

Additional Information

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

• Lord Mahavira, born as Vardhamana, is considered the founder of Jainism and is one of the most revered figures in the religion.

• The Jal Mandir is one of the five main temples in Pawapuri and attracts numerous devotees and tourists every year.

• King Nandivardhan was the elder brother of Lord Mahavira and played a significant role in spreading Jainism.

• The temple's serene setting and spiritual significance make it a unique and sacred site for the Jain community.

Q95. Answer: (b) Genetics

The correct answer is Genetics

Key Points

• Genetics is the branch of biology that focuses on the study of inheritance patterns and how traits are passed from one generation to the next.

• It involves the analysis of genes, genetic variation, and heredity in organisms.

• Genetics plays a crucial role in understanding the mechanisms of evolution, the functioning of organisms, and various biological processes.

• Key topics within genetics include DNA structure and function, gene expression, genetic mutations, and genetic disorders.

Additional Information

• The study of genetics began with the work of Gregor Mendel in the 19th century, who is known as the father of modern genetics.

• Genetics has applications in various fields such as medicine, agriculture, forensic science, and biotechnology.

• Advancements in genetic research have led to developments in genetic engineering, gene therapy, and personalized medicine.

• Understanding genetics helps in predicting the likelihood of inheriting certain traits and diagnosing genetic disorders.

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Q96. Answer: (b) Lakshya Sen

The correct answer is Lakshya Sen

Key Points

• Lakshya Sen won the final of the men's singles at the India Open 2022.

• The India Open is an annual badminton tournament held in India and is part of the BWF World Tour.

• Lakshya Sen's victory at the India Open 2022 marks a significant achievement in his badminton career.

• He is one of the promising young talents in Indian badminton and has achieved several accolades at a young age.

Additional Information

• India Open is part of the HSBC BWF World Tour Super 500 series, which attracts top badminton players from around the world.

• The tournament is organized by the Badminton Association of India (BAI) and has been held annually since 2008.

• In addition to the men's singles, the India Open features competitions in women's singles, men's doubles, women's doubles, and mixed doubles.

• Previous winners of the men's singles title at the India Open include renowned players like Lee Chong Wei and Kento Momota.

Q97. Answer: (b) 64/25

Given:

We have,

((- 2)/5)^(- 2) × ((- 4)/5)^4

=> (5/(-2))²× ((-4)/5)^4

=> (25/4) × (256/625)

=> 64/25

Therefore Option 2 is the correct answer.

Q98. Answer: (d) Lawyer

The correct answer is Lawyer

Key Points

• Deshbandhu Chittaranjan Das was a prominent Indian freedom fighter and lawyer.

• He played a significant role in the Indian independence movement and was known for his legal acumen and dedication to the cause of freedom.

• Chittaranjan Das defended many political leaders and activists who were prosecuted by the British authorities.

• He is also known for his efforts in the Non-Cooperation Movement and his association with the Indian National Congress.

• Das was a mentor to several other prominent freedom fighters, including Subhas Chandra Bose.

Additional Information

• Born on 5th November 1870, Chittaranjan Das hailed from a well-known family in Bengal.

• He completed his education in England and returned to India to practice law.

• Das was also a poet and a writer, contributing significantly to Bengali literature.

• He founded the Swaraj Party in 1923 to further the cause of self-governance in India.

• Chittaranjan Das passed away on 16th June 1925, but his legacy continues to inspire generations of Indians.

Q99. Answer: (b) 3

Given number: '34135278'

After arranged in ascending order:

Digits	**3**	**4**	**1**	**3**	**5**	**2**	**7**	**8**
Ascending order	1	2	3	3	4	5	7	8

After arranged in ascending order,

The positions of the digits that remain unchanged are:

Digit 3 at the third position in the original number remains at the third position in ascending order,

Digit 7 at the seventh position in the original number remains at the seventh position in ascending order,

Digit 8 at the eighth position in the original number remains at the eighth position in ascending order,

Hence, the correct answer is "Option 2".

Q100. Answer: (b) Pradhan Mantri Suraksha Bima Yojana (PMSBY)

The correct answer is Pradhan Mantri Suraksha Bima Yojana (PMSBY)

Key Points

• Under the Pradhan Mantri Suraksha Bima Yojana (PMSBY), insurance is provided with a premium of Rs. 20 per annum.

• This premium is deducted from the account holder's bank account through an auto-debit facility in one installment.

• PMSBY offers coverage for accidental death and disability.

• It is one of the government's social security schemes aimed at providing affordable insurance to all citizens, especially the economically weaker sections.

Additional Information

• The Pradhan Mantri Suraksha Bima Yojana (PMSBY) was launched by the Government of India to provide accidental death and disability cover for a very nominal premium.

• Eligibility for PMSBY includes individuals aged between 18 and 70 years having a bank account.

• The scheme is renewable annually and is administered through public sector general insurance companies and other general insurance companies willing to offer the product on similar terms.

• In case of accidental death or full disability, the risk coverage under the scheme is Rs. 2 lakh, and for partial disability, it is Rs. 1 lakh.

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