RRB Group D Previous Year Paper (Held on: 13 Sept 2022 Shift 3)

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

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CBT

Q1. Systolic pressure is a measure of _____.

(a) ventricular contraction
(b) ventricular relaxation
(c) Atrial Contraction
(d) Atrial relaxation

Q2. Which of the following awards is given for significant contribution in the field of atomic energy?

(a) Shanti Swarup Bhatnagar Prize
(b) Dr. B.C.Roy Award
(c) Borlaug Award
(d) Homi Bhabha Award

Q3. The ratio of the ages of Kamal and Kiran is 4 : 5. After 6 years Kamal's age will be 30 years. What is Kiran's present age?

(a) 28 years
(b) 40 years
(c) 24 years
(d) 30 years

Q4. Which of the following circulates throughout the body, and stops bleeding by helping to form a blood clot at the site of injury?

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

Q5. Which of the following statements regarding the Himalayas is incorrect?

(a) Kumaon is situated between the Himalayas, Sutlej and Kali rivers.
(b) The outermost mountain range of the Himalayas is called Shivalik.
(c) The Patkai Hills are situated between the Lesser Himalayas and the Shivalik Range.
(d) The Brahmaputra is located in the easternmost range of the Himalayas.

Q6. Which of the following describes the nature of the roots of the quadratic equation 5x2 - 16x + 10 = 0 ?

(a) a real root and an imaginary root
(b) two identical roots
(c) No real origin
(d) two different real roots

Q7. The cost of three chairs and two tables is Rs. 1,850. The cost of five chairs and three tables is Rs. 2,850. Find the cost of two chairs and two tables.

(a) Rs. 1,700
(b) Rs. 1,400
(c) Rs. 700
(d) Rs. 1,300

Q8. All the students of a class are sitting in a row facing north. Preeti is 17th from the beginning of the row. Poonam is sitting ahead of Preeti and there are only four students between them. Poonam is 16th from the end of the row. Find the number of students in the class.

(a) 37
(b) 29
(c) 26
(d) 27

Q9. According to the Ministry of New and Renewable Energy, more than 95% of the commercially exploitable wind resources out of the total estimated potential is concentrated in how many states of India?

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

Q10. Which edition of 'Khelo India Youth Games' was held in June 2022?

(a) third
(b) First
(c) Fourth
(d) Second

Q11. According to the Constitution of India, which of the following is not a fundamental duty of a citizen?

(a) Understand the importance of the glorious tradition of our composite culture and preserve it
(b) Men and women have equal right to adequate means of livelihood
(c) Defend the country and render national service when called upon to do so
(d) To cherish and follow the noble ideals that inspired our national struggle for freedom

Q12. Which of these waste items should not be thrown in the general waste?

(a) old furniture
(b) Old Batteries
(c) Old shoes
(d) Old pots

Q13. In March 2022, which Indian cricketer broke Kapil Dev's record for the highest score by an Indian player batting at number 7 or below in Test cricket by scoring an unbeaten 175 in a Test match against Sri Lanka?

(a) Rishabh Pant
(b) Virat Kohli
(c) ravindra jadeja
(d) Rohit Sharma

Q14. _____ of the Indian Constitution prescribes the qualifications for membership of the Parliament.

(a) Article 81
(b) Article 82
(c) Article 83
(d) Article 84

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Q15. Find the volume (in cm^3) of a solid right circular cylinder whose base diameter is 7 cm and height is 20 cm.
[Use π = 22/7]

(a) 1440
(b) 980
(c) 770
(d) 3080

Q16. All 30 students of a class are standing in a straight line facing north. Amit is 12th from the left end of the line. What will be his position from the right end of the line?

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

Q17. Two resistances of 20 Ω each are connected in parallel. This combination is then connected in series with a third resistance of 20 Ω and a 3 V battery. The power supplied by the battery will be _____.

(a) 0.675 W
(b) 0.15 W
(c) 1.35 W
(d) 0.30 W

Q18. As per information received till March 2022, which of the following banks is the largest private sector bank in India?

(a) ICICI Bank
(b) Kotak Mahindra Bank Limited
(c) axis Bank
(d) HDFC Bank

Q19. The exchange of carbon dioxide and oxygen in plants takes place through _____.

(a) plasmolysis
(b) Fermentation
(c) Diffusion
(d) osmosis

Q20. Select the number that will come in place of question mark (?) in the following series.
54, 149, 294, 489, ?

(a) 734
(b) 674
(c) 596
(d) 692

Q21. To get strong signal from the dish antenna the receiver of the dish antenna should be placed _____.

(a) On the front of the dish F
(b) Between C and F in front of the dish
(c) Behind the dish
(d) on the front of the dish C

Q22. The total surface area of a solid hemisphere is 42 cm ^(2.) Find its radius (in cm). (π = 22/7 Assume)

(a) (7 √2)/√11
(b) 7/√22
(c) 7/√11
(d) (7 √3)/√22

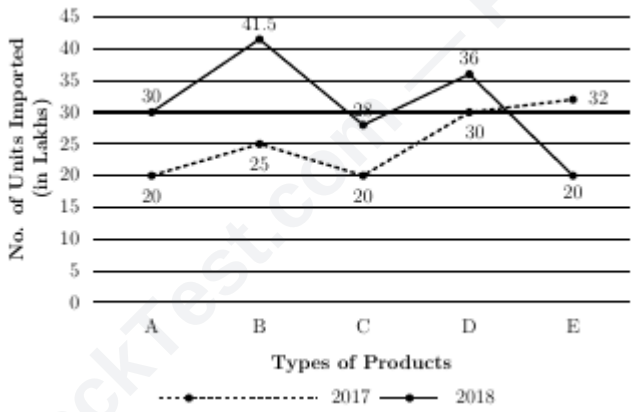
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Q23. Select the term which will come in place of the question mark (?) in the given series and complete the series logically?

TR11, Q016, NL21, KI26, ?

(a) HF31
(b) KG33
(c) HF33
(d) KG31

Q24. The following line graph shows the total number (in lakhs) of different products A, B, C, D and E imported by a company in 2017 and 2018. Study the graph and answer the following question.



Reference :

No. of Units imported (in lakhs): No. of Units imported (in lakhs)

Types of products : Types of products

The import of which type of product in 2017 was equal to the average import of types A and E in 2018?

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

Q25. What approximate value should come in place of question mark (?) in the following equation?

12.89 + 3.05 × 84.95 ÷ 5.07 - 23.88 ?

(a) 48
(b) 44
(c) 35
(d) 40

Q26. As per the Government Budget 2022 - 23, what is the projected growth rate of the Indian economy for the financial year 2022 - 23?

(a) 9.1%
(b) 9.3%
(c) 9.4%
(d) 9.2%

Q27. Which of the following molecular formulas belongs to cyclic hydrocarbons?

(a) C6H12
(b) C5H12
(c) C4H10
(d) C7H16

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Q28. In India, the Industries (Development and Regulation) Act was enacted in _____.

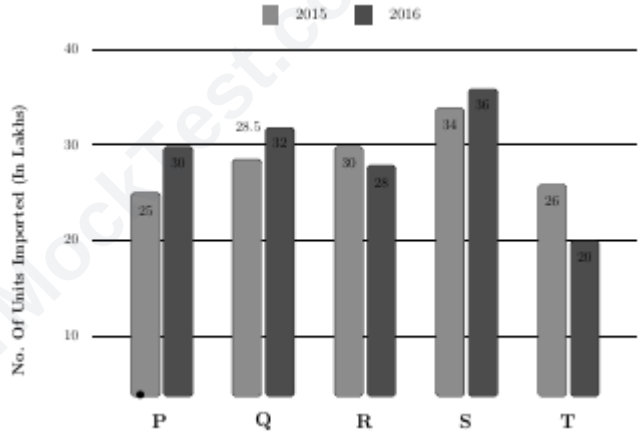
(a) 1957
(b) 1951
(c) 1954
(d) 1953

Q29. Select the number from the given options that can replace the question mark (?) in the following series.

2, 4, 5, 11, 20, 36, ?

(a) 71
(b) 74
(c) 67
(d) 56

Q30. The following bar graph shows the total number (in lakhs) of different types of telephones P, Q, R, S and T imported by a company in 2015 and 2016. Study the graph and answer the question.



Reference :

No. of Units imported (in lakhs) : Number of units imported (in lakhs)

Type of Telephones : Types of Telephones

The average import of type Q and R telephones in 2016 was equal to the average import of which type telephones in 2015?

(a) P and Q
(b) Q and R
(c) R and S
(d) S and T

Q31. When a photograph of the Earth is taken from space, why does its background appear black?

(a) because there is no scattering of light
(b) because there is no refraction of light
(c) because there is no reflection of light
(d) because there is no dispersion of light

Q32. This question is based on the following three letter words.

(left) BAT DIG FIT WIN (right)

Which of the following will form a meaningful English word if 'T' is added before each word?

(a) ONLY WIN
(b) ONLY BAT
(c) ONLY DIG
(d) ONLY FIT

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Q33. Tanvi, after spending 80% of her monthly salary, saves Rs. 5,000 from her salary every month. What is Tanvi's salary?

(a) Rs. 35,000
(b) Rs. 20,000
(c) Rs. 25,000
(d) Rs. 30,000

Q34. Find the value of $\{1 + (1 – 2)^{(-1)}+ 2 - (1 - 2)^{(-2)}\}^2$

(a) 9
(b) 0
(c) 8
(d) 1

Q35. A person sells a sofa at a certain price. If he sells this sofa at 60% of this price, he will incur a loss of 20%. What will be the profit percentage on selling the sofa at its original selling price?

(a) 12%
(b) 15 1/2 %
(c) 33 1/3 %
(d) 12 1/2 %

Q36. If 13 : 12 :: x : 60, then find the value of x.

(a) 91
(b) 56
(c) 78
(d) 65

Q37. In March 2022, who was appointed the Chairman of Air India?

(a) Adi Godrej
(b) Ratan Tata
(c) N Chandrasekaran
(d) M Damodaran

Q38. In the given letter-group pair, the first letter-group is related to the second letter-group following a certain logic. Study the given pairs carefully and select the pair from the options which follows the same logic.

DHP : HLT

MSO : QWS

(a) SWE : WJO
(b) WSE : WJO
(c) SEW : WOJ
(d) SKF : WOJ

Q39. Find the discriminant of the equation $4x^2 - 5x - 3 = 0$.

(a) 73
(b) 23
(c) -23
(d) -73

Q40. Find the fractional form of 8.4646....

(a) 84/99
(b) 846/99
(c) 838/99
(d) 83/99

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Q41. Naphthalene balls are prepared from _____.

(a) Coke
(b) petroleum
(c) bitumen
(d) coal gas

Q42. Find the value of 72 ÷ (9 – 7) of 3 - 6 × 2 + 8.

(a) 68
(b) 104
(c) 8
(d) 44

Q43. The number of factors of any prime number is _____.

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

Q44. Which of the following is a two carbon molecule?

(a) lactic acid
(b) Ethanol
(c) Pyruvic acid
(d) Glucose

Q45. Find the value of $\sin^2\theta + \cos^2\theta - (\sec^2\theta - \tan^2\theta) + \tan\theta \cos\theta - \sin\theta$.

(a) $4 \sin\theta \cos\theta$
(b) $\sec^2\theta$
(c) -1
(d) 0

Q46. If the number of sides in a regular polygon is 12, then what will be the measure of each of its exterior angles?

(a) 30°
(b) 48°
(c) 40°
(d) 36°

Q47. Where has India's first e-waste (electronic waste) clinic been established?

(a) Jaipur
(b) Bhopal
(c) Hyderabad
(d) Bangalore

Q48. Which of the following aqueous solutions is formed by the reaction of copper sulphate solution with zinc metal?

(a) Zinc Sulfide
(b) Zinc Sulphate
(c) Zinc Cuprite
(d) Zinc Oxide

Q49. Electromagnet is formed on _____.

(a) By passing current through a coil coiled around a glass rod
(b) Placing a magnet near a current carrying conductor
(c) the current passing through the magnet
(d) To pass current through a coil wound around a soft iron core

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Q50. Generally, oxides of metals are _____ in nature.

(a) amphoteric
(b) Moody
(c) Acidic
(d) Alkaline

Q51. A man walking at a speed of 10 km/h crosses a bridge in 7 1/2 crosses it in minutes. Find the length of the bridge (in m).

(a) 1560
(b) 1250
(c) 1480
(d) 1500

Q52. In March 2022, the Karnataka government announced Vijay Samarasya Yojana, an awareness programme to eradicate _____ in gram panchayats across the state.

(a) illiteracy
(b) poverty
(c) Unemployment
(d) Untouchability

Q53. Mohan borrows an amount of Rs. 2,20,000 at 8% annual simple interest rate. At the end of the first year, he returns Rs. 27,600 in lieu of the principal. If Mohan returns the entire amount along with the first year's interest at the end of the second year, then find the amount returned by him at the end of the second year.

(a) Rs. 2,25,512
(b) Rs. 2,27,600
(c) Rs. 2,25,392
(d) Rs. 2,26,800

Q54. If the digits of the number 31275848 are arranged in descending order from left to right, then what will be the sum of the first 3 digits from the left?

(a) 12
(b) 20
(c) 23
(d) 6

Q55. A strong magnet is moved towards a stationary coil. When the angle between the direction of motion of the magnet and the plane of the coil is _____, then the induced current in the coil will be minimum.

(a) 0°
(b) 30°
(c) 90°
(d) 60°

Q56. Answer the question based on the following number series.

6 3 5 3 5 6 3 2 2 2 5 1 9 5 4 8 9 5 2 7

How many such numbers are there in the above series, each of which is immediately preceded by an odd number, and immediately followed by an even number?

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

Q57. Three statements are given followed by three conclusions. Consider the statements and conclusions as true, even if they seem to be at variance with commonly known facts, and then find out which of the conclusions logically follow(s) from the statements?

statement :

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1. Some nails are rings.
2. All rings are fingers.
3. All nails are bracelets.

conclusion :

(I) Some bracelets are rings.

(II) Some fingers are nails.

(III) No ring is a bracelet.

(a) Only conclusion II follows.
(b) Only conclusion I and II follow
(c) Only conclusion III follows.
(d) No conclusions follow.

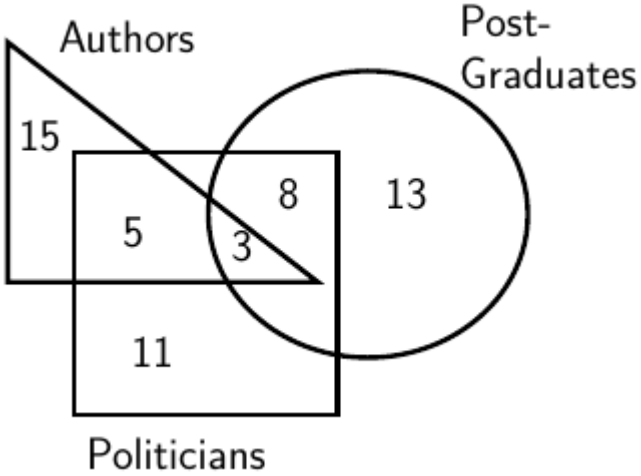
Q58. Beshak, a festival celebrated on the full moon day of the lunar month Vaisakha, which falls in April or May, is a festival of which religion?

(a) sikhism
(b) Judaism
(c) Buddhism
(d) Jainism

Q59. What is the primary purpose of rainwater harvesting?

(a) Collecting pure fresh drinking water
(b) Promoting drip irrigation
(c) Reducing dependence on municipal water
(d) Helping every drop of rain seep into the ground

Q60. Study the given diagram carefully, and answer the question asked. The numbers given in different sections represent the number of persons.



How many people are politicians as well as authors but do not have post graduate degree?

(a) 3
(b) 11
(c) 5
(d) 8

Q61. What is the physical state of the precipitate in a chemical reaction?

(a) Aquatic
(b) Solid
(c) liquid
(d) Gaseous

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Q62. City C is to the north of city F. City O is to the east of city F. City Z is to the west of city O. City Y is to the south of city Z. City C is to the north - east of city Y. In which direction is city C located with respect to city Z?

(a) North-East
(b) South-East
(c) North
(d) North - West

Q63. Farhan starts walking from his house and walks a distance 'Y' towards east. Then he turns right and walks 10 m. After that, he again turns right and walks 25 m then he turns left and walks 10 m, then turns right and walks 15 m. Finally he turns right and walks 20 m to reach his house. Find the value of Y.

(a) 40 m
(b) 50 m
(c) 55 m
(d) 30 m

Q64. Shri Bhagawan Mahaveer Government Museum is located in _____.

(a) Karnataka
(b) New Delhi
(c) Maharashtra
(d) Andhra Pradesh

Q65. If 5th March 2009 is Thursday, then what day of the week will be on 11th March 2016?

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

Q66. Which two signs in the given equation should be interchanged to make the equation balanced?

28 ÷ 4 - 12 × 5 + 11 = 56

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

Q67. Which of the following has a pH value lower than pure water?

(a) milk of magnesia
(b) NaOH
(c) NH4OH
(d) gastric juice

Q68. Which of the following devices is not based on the heating effect of electric current?

Electric kettle, electric bulb, oven, electric generator

(a) electric generator
(b) electric light bulb
(c) Oven
(d) electric kettle

Q69. Select the set in which the numbers contain the same relationship as the numbers in the following sets.

(Note: Operations must be performed on whole numbers without splitting the numbers into their constituent digits. For example, operations on 12, such as addition/subtraction/multiplication, etc., must be performed on 12 only. Splitting 12 into 1 and 2, and then performing mathematical operations on 1 and 2 is not allowed.)

(15, 450, 10)

(12, 540, 15)

(a) (5, 25, 5)
(b) (11, 330, 10)

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(c) (9, 18, 81)
(d) (5, 60, 6)

Q70. A group of numbers/symbols is coded using letters as per the table given below and the conditions followed by the given letters. The correct combination of codes as per the conditions will be your answer.

Numbers/Symbols	**4**	**&**	**5**	**^**	**8**	**@**	**2**	**6**	**%**	**$**	**9**	**5**	**3**	**#**
code letter	G	B	H	T	V	M	A	K	L	D	F	E	Q	U

terms :

(i) If the first component is a symbol and the last component is a number, then the codes of both these (first and last components) are to be interchanged.

(ii) If the first component is an odd number and the last component is an even number, then the first and the last components are to be



coded as.

(ii) If both the second and the third components are perfect squares, then the third component will be coded as the code for the second component.

What is the code for ^ $ 9 # 8?

(a) TDUFV
(b) VDFUT
(c) VDUFT
(d) TDFUV

Q71. The value of $16x^2 + 4y^2 + 25z^2 - 16xy + 20yz - 40zx$ is equal to _____.

(a) $(4x + 2y - 5z)^2$
(b) $(4x - 2y - 5z)^2$
(c) $(4x + 2y + 5z)^2$
(d) $(4x - 2y + 5z)^2$

Q72. The following distribution shows the mean literacy rate of some cities.

Literacy rate in %	**Number of cities**
25 - 35	6

35 - 45	5
45 - 55	4
55 - 65	1

Find the mean literacy rate of all cities.

(a) 32
(b) 28
(c) 40
(d) 36

Q73. Answer the question based on the following letter, number and symbol series.

(left) V 2 5 @ ρ 9 W ¥ # 2 Ω RQ 1 @ FB 4 # H 6 J % Y 3 Z (right)

If all the numbers are dropped from the above series, which of the following will come at the fifth place from the right?

(a) H
(b) B
(c) J
(d) #

Q74. Eight persons L, M, N, O, P, Q, R and S were sitting around a square table facing the centre. Some of them were sitting at its corners while some were sitting exactly in the middle of the sides. P was sitting fourth to the left of Q. Only O was sitting between M and Q. N was sitting immediate right of L. R was sitting immediate left of M. L and P were sitting at the corners. Who was sitting fourth to the left of R?

(a) L
(b) O
(c) N
(d) S

Q75. In this question, a statement is given followed by four conclusions. Find out which of the given conclusions is true based on the given statements.

statement: E < H < K = G > F > D

(a) D > G
(b) G > E
(c) K < E
(d) K < D

Q76. A person buys a table for Rs. 2,800 and sells it at a loss of 30%. Find the selling price (in Rs.) of the table.

(a) 1,890
(b) 1,440
(c) 1,960
(d) 1,770

Q77. Which of the following elements is a metalloid?

(a) Bismuth
(b) Iron
(c) Selenium
(d) Antimony

Q78. Which of the following will not react with oxygen at high temperature?

(a) copper
(b) Iron
(c) Aluminium
(d) Nichrome

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Q79. How many branches of Yajurveda are there?

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

Q80. The class of compounds containing such functional groups which do not contain any oxygen atoms are called _____.

(a) Carboxylic acid
(b) Ketones
(c) Aster
(d) Halo Compound

Q81. Which of the following plateaus, with an average elevation of 500 m, is spread over Rajasthan, Madhya Pradesh and Gujarat?

(a) Marwar Plateau
(b) Deccan Plateau
(c) Chota Nagpur Plateau
(d) Malwa Plateau

Q82. Find the least common multiple (LCM) of 70, 28 and 42.

(a) 700
(b) 116
(c) 420
(d) 280

Q83. A pipe can fill an empty tank in 15 minutes while another pipe can empty the same fully filled tank in 20 minutes. If both the pipes are opened simultaneously, then how much time (in minutes) will it take to completely fill the empty tank?

(a) 48
(b) 56
(c) 54
(d) 60

Q84. Choose the conclusion based on the following statement.

Statement : $A \geq Q > z \leq S = O < W$

(a) $Q > O$
(b) $A > O$
(c) $W > Z$
(d) $W \geq A$

Q85. In July 2021, which government's Women and Child Development (WCD) department implemented a policy to identify destitute children, and assigned the responsibility of identifying and rehabilitating them to 10 of its agencies?

(a) West Bengal
(b) Punjab
(c) Jammu and Kashmir
(d) Delhi

Q86. Which of the following awards is given to Gram Panchayats/Gram Parishads for their outstanding contribution to socio-economic development by involving village councils?

(a) Gram Panchayat Development Plan Award (GPDPA)
(b) Deen Dayal Upadhyaya Panchayat Empowerment Award (DDUPSP)
(c) Child Friendly Gram Panchayat Award (CFGPA)
(d) Nanaji Deshmukh National Gaurav Gram Sabha Award (NDRGGSP)

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Q87. 100 surnames are selected at random from a local telephone directory, and the frequency distribution of the number of letters from the English alphabet in the surnames is obtained as follows.

Number of letters	1-4	4-7	7-10	10-13	13-16	16-19
Number of Surnames	6	30	40	16	4	4

Reference: [Number of letters, Number of surnames]

Find the median number of letters in surnames.

(a) 8.05
(b) 7.04
(c) 7.09
(d) 8.02

Q88. In this question, a group of letters is coded using symbols as per the table given below followed by the conditions. The correct combination of codes that follows the conditions is your answer.

Letter	A	S	V	J	I	L	N	E
Code	@		^	%	=	#	$	•

terms:

1. If both the first and last letters of the word are vowels, then both these letters will be coded as '&'.
2. If both the first and last letters of a word are consonants, then the first letter of the word will be coded as '*'.

What will be the code for the word 'JAVELINS'?

(a) % @ ^ + # = $ *
(b) % > ^ + # = $ >
(c) % @ ^ + # = $ >
(d) • @ ^ + # = $ >

Q89. Select the option that has the same relation with the fifth number as the second number is with the first number, and the fourth number is with the third number.

14 : 196 :: 16 : 256 : 18 : ?

(a) 328
(b) 324
(c) 314
(d) 326

Q90. Select the correct example for mechanical barrier method of contraception from the options given below.

(a) Male Sterilization
(b) Condom use
(c) Use of Copper-T
(d) Use of birth control pills

Q91. What happens when calcium sulphate hemihydrate is mixed with water?

(a) It solidifies as a hard solid mass.
(b) SO 2 gas is liberated.
(c) A clear solution is formed.
(d) Lime water is formed.

Q92. Simplify.

$x^2 + y^2 + (x - y)^2 + (x + y)^2 - 20$

(a) $3x^2 + 3y^2 - 20$
(b) $3x^2 - 3y^2 - 20$
(c) $3x^2 - 3y^2 + 20$

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(d) $3x^2 + 3y^2 + 20$

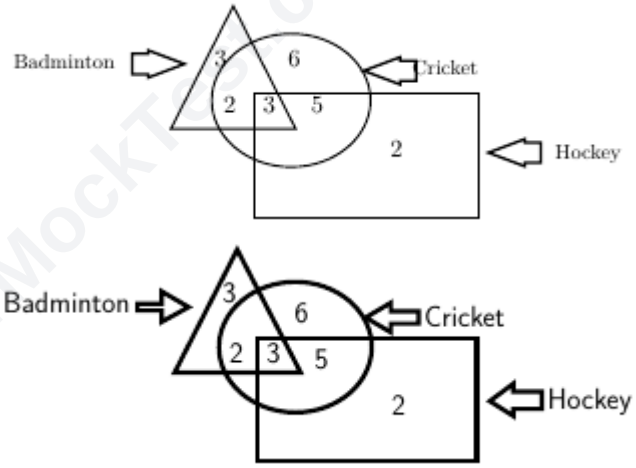
Q93. When a ray of light enters from a denser medium to a rarer medium, then _____.

(a) it is not refracted
(b) It bends towards the normal.
(c) It bends away from the normal.
(d) Its angles of incidence and refraction are equal.

Q94. A beam of light parallel to the _____ of a concave mirror will pass through the principal focus after reflection.

(a) object on principal axis
(b) Mirror surface
(c) Main axis
(d) Focus plane

Q95. Study the following diagram carefully and answer the question based on it.
The numbers in different sections represent the number of people playing different sports.



How many people play both Hockey and Cricket but do not play Badminton?

(a) 2
(b) 3
(c) 5
(d) 8

Q96. As per the information received till 31 March 2022, which of the following states has Hindi as the official language?

(a) Arunachal Pradesh
(b) Rajasthan
(c) Goa
(d) Punjab

Q97. Some people are sitting in a row facing north. Y is sitting fourth to the right of A. Only four people are sitting between Y and Z. B is sitting second to the left of Z. Only one person is sitting between Z and C. X is sitting immediately next to the right of C. X is sitting at one of the ends of the row. If no other person is sitting in the row, then what is the total number of people sitting in the row?

(a) 12
(b) 15
(c) 14
(d) 13

Q98. Six persons, A, B, C, D, E and F are sitting in a straight line facing north (but not necessarily in the same order). Only one person sits to the left of D. Only two persons sit between F and C. B sits third to the right of E. D sits immediate left of F. E sits at the left end. To whom of the following both A and F sit immediate next to?

(a) C
(b) E

(c) B
(d) D

Q99. Read the given statements and arguments carefully and choose the appropriate answer from the given options.

statement :

Indian society is a symbol of unity in diversity.

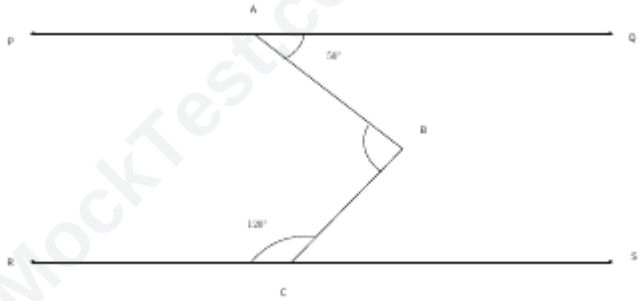
Logic:

I. People of different cultural identities live with pride in the Indian society.

II. Brain drain is an indicator of unity in diversity in India.

(a) II does not support the statement while I supports the statement.
(b) Both I and II support the statement.
(c) Both I and II do not support the statement.
(d) I does not support the statement, while II supports the statement.

Q100. In the following figure, if PQ || RS, then find the value of angle ABC.



(a) 110°
(b) 140°
(c) 70°
(d) 90°

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) ventricular contraction

The correct answer is ventricular contraction.

Key Points

• Systolic pressure is the higher number in a blood pressure reading and indicates the pressure in the arteries when the heart's ventricles contract.

• It is a critical measure in determining cardiovascular health as it reflects the force exerted on artery walls during heartbeats.

• Normal systolic pressure is typically around 120 mm Hg or lower in adults.

• Elevated systolic pressure (hypertension) can increase the risk of heart disease and stroke.

Additional Information

• Blood Pressure:

• Blood pressure is the force of blood pushing against the walls of the arteries as the heart pumps blood.

• It is measured in millimeters of mercury (mm Hg) and recorded with two numbers: systolic pressure (higher number) and diastolic pressure (lower number).

• Normal blood pressure is usually considered to be 120/80 mm Hg.

• Diastolic Pressure:

• Diastolic pressure is the lower number in a blood pressure reading and indicates the pressure in the arteries when the heart's ventricles are at rest between beats.

• Normal diastolic pressure is typically around 80 mm Hg or lower in adults.

• Elevated diastolic pressure (hypertension) can also increase the risk of cardiovascular diseases.

• Ventricular Contraction:

• This term refers to the phase of the cardiac cycle when the ventricles contract to pump blood out of the heart.

• During this phase, the left ventricle pumps oxygenated blood to the body through the aorta, and the right ventricle pumps deoxygenated blood to the lungs through the pulmonary artery.

• Effective ventricular contraction is essential for maintaining adequate blood circulation throughout the body.

• Hypertension:

• Hypertension, or high blood pressure, is a condition in which the force of the blood against the artery walls is too high.

• It is often a chronic condition that can lead to serious health issues such as heart disease, stroke, and kidney problems if not managed properly.

• Regular monitoring and lifestyle changes, along with medication if necessary, are crucial for managing hypertension.

Q2. Answer: (d) Homi Bhabha Award

The correct answer is Homi Bhabha Award.

Key Points

• The Homi Bhabha Award is given for significant contributions in the field of atomic energy.

• The award is named after Dr. Homi Jehangir Bhabha, who is known as the father of India’s nuclear programme.

• Dr. Homi Bhabha was a renowned Indian nuclear physicist, who was instrumental in establishing the Tata Institute of Fundamental Research and the Atomic Energy Commission in India.

• This award recognizes and honors individuals or organizations that have made significant advancements and contributions to atomic energy and its applications.

Additional Information

• Shanti Swarup Bhatnagar Prize

• It is one of the most prestigious science awards in India, named after the founder director of the Council of Scientific & Industrial Research (CSIR), Shanti Swarup Bhatnagar.

• This award is given annually to scientists for their outstanding research in various fields of science and technology.

• It covers areas such as Physical Sciences, Chemical Sciences, Biological Sciences, Mathematical Sciences, Engineering Sciences, Medical Sciences, and Earth, Atmosphere, Ocean, and Planetary Sciences.

• Dr. B.C. Roy Award

• This award is given in the field of medicine and is named after Dr. Bidhan Chandra Roy, an eminent physician, freedom fighter, and the second Chief Minister of West Bengal.

• It is awarded annually by the Medical Council of India and recognizes outstanding contributions in the field of medicine and medical research.

• Borlaug Award

• The Borlaug Award is named after Dr. Norman E. Borlaug, a Nobel laureate and the father of the Green Revolution.

• This award is given for outstanding contributions to agriculture and food production.

• It honors individuals who have made significant advancements in increasing food production, reducing hunger, and improving nutrition.

Q3. Answer: (d) 30 years

Shortcut Trick

Kamal current age = 30 − 6 = 24 years.

Ratio of Kamal : Kiran = 4 : 5.

4 units → 24 years => 1 unit → 6 years.

5 units (Kiran) → 5 × 6 = 30 years.

Therefore The correct answer is 30 years.

Alternate Method

Given:

Ratio of Kamal and Kiran = 4 : 5

Kamal age after 6 years = 30 years

Calculations:

=> Let Kamal present age be 4x and Kiran present age be 5x.

=> Kamal age after 6 years = 4x + 6

=> 4x + 6 = 30

=> 4x = 30 − 6

=> 4x = 24

=> x = 6

=> Kiran present age = 5x = 5 × 6 = 30 years

Therefore The correct answer is 30 years.

Additional Information

Ratio and Ages

If the ratio of ages is a:b, we assume ages as ax and bx to form linear equations based on given time conditions.

Age After 'n' Years

If present age is A, then age after n years is (A + n) and age n years ago was (A − n).

Age Difference

The difference between the ages of two persons remains constant regardless of the number of years passed or gone by.

Q4. Answer: (b) Platelets

The correct answer is Platelets.

Key Points

• Platelets, also known as thrombocytes, are small, colorless cell fragments in our blood whose main function is to stick to the lining of blood vessels and help stop or prevent bleeding.

• When a blood vessel gets damaged, platelets are activated and gather at the site of injury to form a plug (clot) to stop bleeding.

• Platelets are produced in the bone marrow, the spongy tissue inside our bones.

• They circulate in the bloodstream for an average of 7-10 days before being removed by the spleen.

Additional Information

• White Blood Cells (WBC)

• Also known as leukocytes, WBCs are part of the immune system and help the body to fight infections and other diseases.

• They are produced in the bone marrow and are found in the blood and lymphatic tissues.

• There are several types of white blood cells, including neutrophils, lymphocytes, monocytes, eosinophils, and basophils.

• Plasma

• Plasma is the liquid component of blood, making up about 55% of its total volume.

• It is composed mainly of water, but also contains proteins, electrolytes, hormones, and waste products.

• Plasma serves as a medium for transporting nutrients, hormones, and proteins to the parts of the body that need it.

• Red Blood Cells (RBC)

• Also known as erythrocytes, RBCs are responsible for carrying oxygen from the lungs to the rest of the body and returning carbon dioxide from the body to the lungs to be exhaled.

• They are produced in the bone marrow and have a lifespan of about 120 days.

• RBCs contain hemoglobin, a protein that binds oxygen and gives blood its red color.

Q5. Answer: (c) The Patkai Hills are situated between the Lesser Himalayas and the Shivalik Range.

The correct answer is The Patkai Hills are situated between the Lesser Himalayas and the Shivalik Range..

Key Points

• The Patkai Hills are not situated between the Lesser Himalayas and the Shivalik Range.

• The Patkai Hills are actually located in the northeastern part of India, forming the boundary between India and Myanmar.

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• The Patkai Hills are part of the Purvanchal Range, which lies to the south of the Brahmaputra valley.

• The Purvanchal Range includes other hill ranges like the Naga Hills, Manipur Hills, Mizo Hills, and the Tripura Hills.

Additional Information

• The Himalayas

• The Himalayas are a mountain range in South Asia, separating the plains of the Indian subcontinent from the Tibetan Plateau.

• They are home to the planet's highest peaks, including the highest, Mount Everest in Nepal.

• The Himalayas include over fifty mountains exceeding 7,200 meters (23,600 ft) in elevation, including ten of the fourteen 8,000-meter peaks.

• The Himalayas have profoundly shaped the cultures of South Asia; many Himalayan peaks are sacred in Hinduism and Buddhism.

• Shivalik Range

• The Shivalik Hills, also known as the Outer Himalayas, extend from the Indus River in the west to the Brahmaputra River in the east.

• They are the southernmost and geologically youngest east-west mountain chain of the Himalayas.

• The range is about 2,400 km long and varies in width from 10 to 50 km.

• The average height of the Shivalik Hills is between 900 to 1,200 meters (3,000 to 4,000 ft).

• Brahmaputra River

• The Brahmaputra is one of the major rivers of the world, flowing in the Tibet Autonomous Region of China, India, and Bangladesh.

• It is about 2,900 km (1,800 mi) long, and its drainage basin is 712,035 km² (274,918 mi²) in size.

• In India, it flows through the states of Arunachal Pradesh and Assam before entering Bangladesh.

• The Brahmaputra plays a key role in the culture, economy, and ecology of the region through which it flows.

• Kumaon

• Kumaon is one of the two regions and administrative divisions of Uttarakhand, a mountainous state of northern India, the other being Garhwal.

• The Kumaon region is bounded on the north by Tibet, on the east by Nepal, on the south by the state of Uttar Pradesh, and on the west by the Garhwal region.

• It comprises the districts of Almora, Bageshwar, Champawat, Nainital, Pithoragarh, and Udham Singh Nagar.

• Kumaon is known for its scenic beauty, rich cultural heritage, and diverse flora and fauna.

Q6. Answer: (d) two different real roots

Shortcut Trick

Calculate the Discriminant (D) for the equation $5x^2 - 16x + 10 = 0$.

$D = b^2 - 4ac = (-16)^2 - 4 \times 5 \times 10$

$D = 256 - 200 = 56$

Since D > 0, the roots are real and distinct.

Therefore The correct answer is two different real roots.

Alternate Method

Given:

The quadratic equation is $5x^2 - 16x + 10 = 0$.

Formula Used:

For a quadratic equation $ax^2 + bx + c = 0$, the nature of roots is determined by the Discriminant (D):

$D = b^2 - 4ac$

Calculations:

Comparing the given equation with the standard form:

=> a = 5, b = −16, c = 10

=> $D = (-16)^2 - 4 \times 5 \times 10$

=> $D = 256 - 200$

=> $D = 56$

As per the rules of quadratic equations:

=> Since D (56) is positive and greater than zero (D > 0), the equation has two different real roots.

Therefore The correct answer is two different real roots.

Additional Information

Discriminant and Nature of Roots

The value $D = b^2 - 4ac$ determines the nature of roots. If $D > 0$, roots are real and unequal. If $D = 0$, roots are real and equal. If $D < 0$, roots are imaginary.

Rational Roots Condition

If D is a perfect square and coefficients a, b, c are rational numbers, then the roots are rational. Otherwise, they are irrational.

Sum and Product of Roots

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

Q7. Answer: (a) Rs. 1,700

Given:

The cost of three chairs and two tables is Rs. 1,850.

The cost of five chairs and three tables is Rs. 2,850.

Calculations:

Let C = cost of one chair and T = cost of one table.

From the equation

=> 3C + 2T = 1850 (Equation 1)

=> 5C + 3T = 2850 (Equation 2)

Multiplying Equation 1 by 3:

9C + 6T = 5550 (Equation 3)

Multiplying Equation 2 by 2:

10C + 6T = 5700 (Equation 4)

Subtracting Equation 3 from Equation 4:

(10C + 6T) - (9C + 6T) = 5700 - 5550

C = 150

Substituting C back into Equation 1:

3(150) + 2T = 1850

450 + 2T = 1850

2T = 1400

T = 700

Finding the cost of two chairs and two tables:

Cost = 2C + 2T = 2(150) + 2(700) = 300 + 1400 = 1700

Therefore The cost of two chairs and two tables is Rs. 1,700.

Q8. Answer: (d) 27

The logic followed here is:

All students are sitting in a row facing north.

Preeti is 17th from the beginning.

Poonam is seated ahead of Preeti, with 4 students in between.

Poonam is 16th from the end.

Step 1: Position of Poonam from the beginning

Since Poonam is ahead of Preeti, and there are 4 students between them, her position from the beginning is:

Position of Poonam = Position of Preeti − (4 + 1) = 17 − 5 = 12

Step 2: Total number of students

We know that Poonam is 12th from the beginning and 16th from the end. Using the formula:

Total students = Position from the beginning + Position from the end − 1

= 12 + 16 − 1 = 27

Thus, the total number of students in the class is 27.

Hence, the correct answer is "Option 4".

Q9. Answer: (d) Seven

The correct answer is Seven.

Key Points

• According to the Ministry of New and Renewable Energy, more than 95% of the commercially exploitable wind resources in India

are concentrated in seven states.

• The seven states are Tamil Nadu, Gujarat, Maharashtra, Karnataka, Rajasthan, Andhra Pradesh, and Madhya Pradesh.

• These states have favorable geographical conditions such as long coastlines, high wind speeds, and large open spaces which are ideal for wind energy generation.

• Wind energy is a crucial part of India's renewable energy strategy and these seven states play a pivotal role in harnessing this resource.

Additional Information

• Ministry of New and Renewable Energy (MNRE)

• The Ministry of New and Renewable Energy is the nodal Ministry of the Government of India for all matters relating to new and renewable energy.

• The broad aim of the Ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country.

• It focuses on the development of wind energy, solar energy, bioenergy, and other renewable energy sources.

• The MNRE also formulates policies, schemes, and programs for the promotion of renewable energy in India.

• Wind Energy in India

• Wind energy is the use of air flow through wind turbines to mechanically power generators for electricity.

• India has a total installed wind power capacity of around 38 GW as of 2020, making it the fourth largest wind power producer in the world.

• The government aims to achieve a wind power capacity of 60 GW by 2022.

• Wind energy is a clean and renewable source of energy that reduces dependence on fossil fuels and helps in reducing greenhouse gas emissions.

• Commercially Exploitable Wind Resources

• Commercially exploitable wind resources refer to the wind energy potential that can be effectively harnessed and converted into electricity using existing technology.

• This potential depends on factors such as wind speed, wind direction, and geographical conditions.

• Areas with high wind speeds and consistent wind patterns are considered to have high commercially exploitable wind resources.

• The seven states mentioned above have been identified as having the highest commercially exploitable wind resources in India.

Q10. Answer: (c) Fourth

The correct answer is Fourth.

Key Points

• The 'Khelo India Youth Games' is an initiative by the Indian government to promote sports and youth engagement in sports activities across the country.

• The fourth edition of the 'Khelo India Youth Games' was held in June 2022.

• The event aims to identify and nurture young sporting talents who can represent India in international sports events.

• The Khelo India program was introduced by the Ministry of Youth Affairs and Sports in 2018.

Additional Information

• Khelo India Youth Games (KIYG)

• The Khelo India Youth Games is a part of the Khelo India program which was launched in 2018 by the Government of India to revive the sports culture in India at the grass-root level.

• The KIYG are held annually and involve multiple sporting disciplines for young athletes under the age of 17 and 21.

• The primary objective of KIYG is to build a strong framework for all sports played in our country and establish India as a great sporting nation.

• The games include sports like athletics, badminton, basketball, boxing, football, gymnastics, hockey, judo, kabaddi, kho-kho, shooting, swimming, volleyball, weightlifting, wrestling, and more.

• Khelo India Program

• It is a national program aimed at developing sports in India, launched by the Ministry of Youth Affairs and Sports.

• The program includes several initiatives such as talent identification, infrastructure development, and financial support for athletes.

• One of the key objectives of the program is to encourage mass participation and promote sports for all.

• It also aims to create awareness about the importance of sports and fitness among the youth.

• Ministry of Youth Affairs and Sports

• The Ministry of Youth Affairs and Sports is responsible for the development and promotion of sports and youth affairs in India.

• It formulates policies, plans, and schemes for the advancement of sports in the country.

• The ministry also collaborates with various state governments, sports federations, and other stakeholders to implement sports programs.

• It aims to create an environment that encourages sports participation and excellence at all levels.

• Sports Infrastructure Development

• The Khelo India program focuses on developing sports infrastructure across the country.

• This includes building new sports facilities, upgrading existing ones, and ensuring they are accessible to athletes and the general public.

• Infrastructure development is crucial for providing athletes with the necessary facilities to train and compete at a high level.

• It also helps in organizing national and international sports events in India.

Q11. Answer: (b) Men and women have equal right to adequate means of livelihood

The correct answer is Men and women have equal right to adequate means of livelihood.

Key Points

• The statement "Men and women have equal right to adequate means of livelihood" is not listed as a Fundamental Duty in the Constitution of India.

• This statement pertains to Directive Principles of State Policy, specifically Article 39(a), which aims to provide equal rights to livelihood.

• Fundamental Duties are listed in Article 51A of the Indian Constitution.

• Fundamental Duties are moral obligations of all citizens to help promote a spirit of patriotism and to uphold the unity of India.

Additional Information

• Fundamental Duties

• The Fundamental Duties are enshrined in Part IV-A of the Indian Constitution (Article 51A).

• They were added by the 42nd Amendment Act in 1976, based on the recommendations of the Swaran Singh Committee.

• There are 11 Fundamental Duties, which include respecting the Constitution, the National Flag, and the National Anthem; cherishing the noble ideals of the freedom struggle; protecting the sovereignty, unity, and integrity of India; promoting harmony; safeguarding public property, and striving for excellence in all spheres of individual and collective activity.

• Directive Principles of State Policy

• These principles are guidelines for the framing of laws by the government.

• They are enshrined in Part IV (Articles 36-51) of the Indian Constitution.

• They are not enforceable by any court but are fundamental in the governance of the country.

• Directive Principles aim to create social and economic conditions under which the citizens can lead a good life. They also aim to establish social and economic democracy through a welfare state.

• Article 39(a)

• Article 39(a) of the Indian Constitution directs the State to secure that the citizens, men and women equally, have the right to an adequate means of livelihood.

• This is part of the Directive Principles of State Policy and aims to ensure economic justice and reduce inequality in income.

Q12. Answer: (b) Old Batteries

The correct answer is Old Batteries.

Key Points

• Old batteries contain hazardous materials such as lead, cadmium, and mercury, which can be harmful to the environment and human health.

• These hazardous components can leach into the soil and water, causing contamination and posing risks to wildlife and human populations.

• Proper disposal of old batteries typically involves recycling or specific disposal methods to prevent environmental damage.

• Many regions have designated collection points or recycling centers for old batteries to ensure they are disposed of safely.

Additional Information

• General Waste

• General waste, also known as residual waste or black bag waste, refers to everyday items that cannot be recycled.

• This includes items such as food waste, non-recyclable packaging, and certain household items that do not contain hazardous materials.

• General waste is typically collected by municipal waste services and disposed of in landfills or incineration facilities.

• Recycling

• Recycling involves converting waste materials into new products to prevent waste of potentially useful materials.

• It helps reduce the consumption of fresh raw materials, energy usage, air and water pollution, and greenhouse gas emissions.
• Common recyclable materials include paper, cardboard, glass, aluminum, and certain plastics.
• Hazardous Waste
• Hazardous waste refers to waste that poses substantial or potential threats to public health or the environment.
• It includes materials like chemicals, batteries, electronic waste, and certain types of medical waste.
• Proper disposal methods for hazardous waste are crucial to prevent environmental contamination and health risks.
• Electronic Waste (E-Waste)
• E-waste refers to discarded electronic appliances such as computers, phones, and televisions.
• It often contains hazardous components and valuable materials that can be recycled.
• Proper e-waste recycling helps recover valuable materials and prevents environmental pollution.

Q13. Answer: (c) ravindra jadeja

The correct answer is Ravindra Jadeja.

Key Points

• Ravindra Jadeja is a renowned Indian cricketer known for his all-round capabilities.
• In March 2022, he scored an unbeaten 175 against Sri Lanka, breaking Kapil Dev's record for the highest score by an Indian player batting at number 7 or below in Test cricket.
• Jadeja's performance in that match was instrumental in helping India secure a strong position.
• He is known for his exceptional fielding skills and has been a crucial part of the Indian cricket team in all formats of the game.

Additional Information

• Kapil Dev
• Kapil Dev is a former Indian cricketer who served as the captain of the Indian cricket team which won the 1983 Cricket World Cup.
• He was known for his fast bowling and his ability to contribute valuable runs lower down the order.
• Kapil Dev held the record for the highest score by an Indian player batting at number 7 or below in Test cricket before Ravindra Jadeja broke it.
• He is considered one of the greatest all-rounders in the history of cricket.
• Test Cricket
• Test cricket is the longest form of the sport of cricket and is considered its highest standard.
• The game is played over five days, and each team has two innings.
• It is a test of endurance, skill, and strategy, making it a prestigious format in cricket.
• Player performances in Test cricket are highly regarded and contribute significantly to a player's legacy.
• Ravindra Jadeja's Role in Indian Cricket
• Ravindra Jadeja is an all-rounder, contributing significantly with both bat and ball.
• He made his debut for the Indian cricket team in 2009 and has since been a vital player in all formats of the game.
• Jadeja is particularly known for his left-arm orthodox spin and his sharp fielding abilities.
• His performances have often turned matches in India's favor, earning him a reputation as a match-winner.

Q14. Answer: (d) Article 84

The correct answer is Article 84.

Key Points

• Article 84 of the Indian Constitution lays down the qualifications for membership of Parliament.
• A person must be a citizen of India to be qualified for membership of the Parliament.
• He/she must be at least 25 years old to be a member of the Lok Sabha (House of the People) and at least 30 years old to be a member of the Rajya Sabha (Council of States).
• Additionally, the person must possess such other qualifications as may be prescribed in that behalf by or under any law made by Parliament.

Additional Information

• Article 81
• Article 81 deals with the composition of the House of the People (Lok Sabha).
• It specifies the maximum number of members in the Lok Sabha and the allocation of seats to the states and union territories.
• Article 82
• Article 82 pertains to the readjustment of seats in the House of the People.

• It mandates that upon completion of each census, the allocation of seats to the states and union territories must be readjusted based on the population data.
• Article 83
• Article 83 deals with the duration of the Houses of Parliament.
• The Lok Sabha has a term of five years from the date appointed for its first meeting, unless dissolved sooner.
• The Rajya Sabha is a permanent body and is not subject to dissolution, but one-third of its members retire every two years.
• Article 84
• Article 84 lays down the qualifications for membership of Parliament, as discussed above.

Q15. Answer: (c) 770

Shortcut Trick
Radius (r) = Diameter ÷ 2 = 7 ÷ 2 = 3.5 cm
Volume = $\pi r^2 h$ = (22/7) × 3.5 × 3.5 × 20
Volume = 11 × 3.5 × 20 = 11 × 70 = 770 cm^3
Therefore The correct answer is 770 cm^3.
Alternate Method
Given:
Diameter (d) = 7 cm
Height (h) = 20 cm
π = 22/7
Formula Used:
Volume of Cylinder (V) = $\pi r^2 h$
Calculations:
=> Radius (r) = 7/2 cm
=> Volume = (22/7) × (7/2) × (7/2) × 20
=> Volume = (22/7) × (49/4) × 20
=> Volume = 22 × (7/4) × 20
=> Volume = 22 × 7 × 5
=> Volume = 154 × 5
=> Volume = 770 cm^3
Therefore The correct answer is 770 cm^3.
Additional Information
Curved Surface Area (CSA)
The area of the curved part of the cylinder is given by $2\pi rh$.
Total Surface Area (TSA)
The sum of CSA and the area of two circular bases: $2\pi rh + 2\pi r^2 = 2\pi r(h + r)$.
Hollow Cylinder Volume
The volume of material in a hollow cylinder with outer radius R and inner radius r is $\pi(R^2 - r^2)h$.

Q16. Answer: (a) 19th

The logic followed here is:
Position of Amit from the left = 12th
Total number of students = 30
Position of Amit from the right = Total number of students - Position of Amit from the left + 1
= 30 - 12 + 1
= 19
Hence, the correct answer is "Option 1".

Q17. Answer: (d) 0.30 W

The correct answer is 0.30 W.
Key Points
• The equivalent resistance of two 20 Ω resistors in parallel: R_eq = (20 * 20) / (20 + 20) = 400 / 40 = 10 Ω
• The total resistance in the circuit: R_total = 10 Ω + 20 Ω = 30 Ω

• The two resistances of 20 Ω each are connected in parallel.

• The equivalent resistance of two 20 Ω resistors in parallel is 10 Ω.

• This equivalent resistance is then connected in series with a third resistance of 20 Ω.

• The total resistance in the circuit is therefore 30 Ω.

• The current through the circuit using Ohm's Law:

I = V / R_total = 3V / 30Ω = 0.1 A

• The power supplied by the battery:

P = V * I = 3V * 0.1A = 0.3 W

Additional Information

• Parallel and Series Resistors:

• In a parallel circuit, the total or equivalent resistance (R_eq) of resistors can be calculated using the formula:

1/R_eq = 1/R1 + 1/R2 + ... + 1/Rn

• For two resistors R1 and R2 in parallel, the equivalent resistance is given by:

R_eq = (R1 * R2) / (R1 + R2)

• In a series circuit, the total resistance (R_total) is the sum of the individual resistances:

R_total = R1 + R2 + ... + Rn

• Ohm's Law:

• Ohm's Law states that the current (I) through a conductor between two points is directly proportional to the voltage (V) across the two points and inversely proportional to the resistance (R) between them:

I = V / R

• Power Calculation:

• The power (P) supplied by the battery can be calculated using the formula:

P = V * I

• Using Ohm's Law, we can substitute I = V / R into the power formula to get:

P = V^2 / R

Q18. Answer: (d) HDFC Bank

The correct answer is HDFC Bank.

Key Points

• HDFC Bank is the largest private sector bank in India by assets and market capitalization as of March 2022.

• The bank was incorporated in August 1994, and it commenced operations as a Scheduled Commercial Bank in January 1995.

• HDFC Bank has a widespread network of over 5,500 branches and 14,000 ATMs across India, catering to both retail and wholesale customers.

• HDFC Bank offers a comprehensive range of financial products and services, including personal banking, business banking, loans, credit cards, and insurance.

Additional Information

• ICICI Bank

• ICICI Bank is another leading private sector bank in India, known for its extensive range of financial products and services.

• It was established in 1994 and has a network of over 5,200 branches and 15,000 ATMs across the country.

• ICICI Bank is known for its innovative banking solutions and robust digital banking platform.

• Kotak Mahindra Bank Limited

• Kotak Mahindra Bank is a prominent private sector bank in India, offering a wide range of banking and financial services to individual and corporate customers.

• It was established in 1985 and received a banking license from the Reserve Bank of India in 2003.

• Kotak Mahindra Bank has a strong presence with over 1,600 branches and 2,500 ATMs across the country.

• Axis Bank

• Axis Bank is one of the largest private sector banks in India, providing a comprehensive suite of financial products and services to its customers.

• It was founded in 1993 and has a network of over 4,500 branches and 12,000 ATMs across India.

• Axis Bank is known for its customer-centric approach and innovative banking solutions.

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Q19. Answer: (c) Diffusion

The correct answer is Diffusion.

Key Points

• Diffusion is the process by which molecules move from an area of higher concentration to an area of lower concentration.

• In plants, diffusion is essential for the exchange of gases such as oxygen and carbon dioxide.

• During photosynthesis, carbon dioxide diffuses into the plant cells, while oxygen, a by-product, diffuses out.

• The process of diffusion does not require energy, making it a passive form of transport in plants.

Additional Information

• Plasmolysis:

• Plasmolysis is the process in which cells lose water in a hypertonic solution.

• It is a phenomenon observed in plant cells where the cell membrane pulls away from the cell wall due to the loss of water through osmosis.

• This process is not involved in the exchange of gases in plants.

• Fermentation:

• Fermentation is a metabolic process that produces chemical changes in organic substrates through the action of enzymes.

• It is used by plants to convert sugars into energy without the use of oxygen.

• This process does not play a role in the exchange of gases in plants.

• Osmosis:

• Osmosis is the movement of water molecules through a selectively permeable membrane from an area of lower solute concentration to an area of higher solute concentration.

• It is a vital process in plant cells for the uptake of water and nutrients.

• However, osmosis is not responsible for the exchange of gases like carbon dioxide and oxygen in plants.

Q20. Answer: (a) 734

The logic followed here is:

Hence, the correct answer is "734".

Q21. Answer: (a) On the front of the dish F

The correct answer is On the front of the dish F.

Key Points

• The receiver of a dish antenna should be placed at the focal point (F) of the dish to receive a strong signal.

• Placing the receiver at the focal point ensures that all the signals reflected by the dish surface are concentrated at this point.

• This concentration of signals at the focal point results in a stronger and clearer reception.

• The focal point is the point where all the reflected signals from the parabolic dish converge.

Additional Information

• Dish Antenna:

• A dish antenna is a type of parabolic antenna that is used to receive or transmit signals.

• The parabolic shape of the dish helps to focus the incoming signal onto the receiver, which is typically located at the focal point.

• Focal Point (F):

• The focal point is a specific point where signals that are parallel to the dish's axis converge after reflecting off the parabolic surface.

• In a parabolic dish antenna, the focal point is crucial for optimal signal reception.

• Signal Reception:

• Signal reception refers to the ability of the antenna to receive electromagnetic signals from a satellite or other signal source.

• Strong signal reception is critical for clear and uninterrupted communication.

• Parabolic Reflector:

• A parabolic reflector is a reflective device that collects or distributes energy such as light, sound, or radio waves.

• Its shape ensures that signals coming in parallel to its axis are reflected to the focal point.

Q22. Answer: (c) 7/√11

Shortcut Trick

For a solid hemisphere, Total Surface Area (TSA) = $3\pi r^2$.

Given TSA = 42 cm^2.

=> 3 × (22/7) × r² = 42
=> r² = (42 × 7) / (3 × 22) = 49/11
=> r = 7/√11 cm.
Therefore The correct answer is 7/√11 cm.
Alternate Method
Given:
Total surface area of solid hemisphere = 42 cm².
Value of π = 22/7.
Formula Used:
Total Surface Area of Solid Hemisphere = 3πr²
Calculations:
=> 3 × (22/7) × r² = 42
=> (66/7) × r² = 42
=> r² = (42 × 7) / 66
=> r² = (7 × 7) / 11
=> r² = 49 / 11
=> r = √(49 / 11)
=> r = 7 / √11 cm
Therefore The correct answer is 7/√11 cm.
Additional Information
Curved Surface Area of Hemisphere
The area of only the curved part is 2πr².
Volume of Hemisphere
The capacity or space occupied is given by (2/3)πr³.
Full Sphere Properties
Surface Area = 4πr² and Volume = (4/3)πr³.

Q23. Answer: (a) HF31

The logic followed here is:
Hence, the correct answer is "HF31".

Q24. Answer: (a) B

Given:
From the graph:
Import of product A in 2018 = 30 lakhs
Import of product E in 2018 = 20 lakhs
Imports in 2017:
A = 20 lakhs
B = 25 lakhs
C = 20 lakhs
D = 30 lakhs
E = 32 lakhs
Formula used:
Average import = (Import of A in 2018 + Import of E in 2018) / 2
Calculations:
=> Average import of A and E in 2018 = (30 + 20) / 2 = 50 / 2 = 25 lakhs
From the graph, the import of product B in 2017 = 25 lakhs
Therefore The import of product B in 2017 was equal to the average import of types A and E in 2018.

Q25. Answer: (d) 40

Approximate Calculation:
Given expression: 12.89 + 3.05 × 84.95 ÷ 5.07 - 23.88
Rounded Values:

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=> 12.89 ≈ 13

=> 3.05 ≈ 3

=> 84.95 ≈ 85

=> 5.07 ≈ 5

=> 23.88 ≈ 24

Rewritten Expression:

13 + 3 × 85 ÷ 5 - 24

Calculations:

=> 3 × 85 = 255

=> 255 ÷ 5 = 51

=> 13 + 51 - 24 = 40

Therefore The approximate value is 40.

Q26. Answer: (d) 9.2%

The correct answer is 0.092.

Key Points

• The projected growth rate of the Indian economy for the financial year 2022-23, as per the Government Budget 2022-23, is 0.092.

• This growth rate projection is based on various economic indicators and assumptions made by the government and financial experts.

• The growth rate reflects the government's expectations for economic expansion and development during the fiscal year.

• Such projections are crucial for planning and policy-making, as they influence budget allocations, investment strategies, and economic reforms.

Additional Information

• Government Budget:

• A government budget is an annual financial statement presenting the government's proposed revenues and spending for a financial year.

• It includes detailed estimates of the anticipated expenditures and expected revenues.

• The budget outlines the government's fiscal policy and economic priorities.

• Projected Growth Rate:

• The projected growth rate is an estimate of the rate at which a country’s economy is expected to grow within a specific period. It is usually expressed as a percentage and is based on various economic models and assumptions.

• This rate helps in understanding the economic health and potential of a nation.

• Fiscal Year:

• A fiscal year (FY) is a one-year period that governments use for accounting and budget purposes.

• It is different from a calendar year and can vary between countries.

• In India, the fiscal year runs from April 1 to March 31 of the following year.

• Economic Indicators:

• Economic indicators are statistical metrics used to gauge the health of an economy.

• They include metrics like GDP, unemployment rates, inflation rates, and more.

• These indicators help policymakers, investors, and analysts make informed decisions.

Q27. Answer: (a) C6H12

The correct answer is (C6H12).

Key Points

• C6H12 is the molecular formula for a cyclohexane, which is a cyclic hydrocarbon.

• Cyclic hydrocarbons are compounds that contain a hydrocarbon ring.

• C6H12 follows the general formula of cycloalkanes, which is C_nH_(2n) where n is the number of carbon atoms in the ring.

• Cyclohexane is a saturated hydrocarbon, meaning it only has single bonds between carbon atoms.

Additional Information

• Cyclic Hydrocarbons

• Cyclic hydrocarbons are organic compounds that consist of carbon atoms arranged in a ring or cycle.

• They can be either saturated (cycloalkanes) or unsaturated (cycloalkenes, cycloalkynes).

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• Cycloalkanes have the general formula C_nH_(2n) and contain only single bonds.
• Cycloalkenes and cycloalkynes contain double and triple bonds, respectively, and have different general formulas.
• Other Options
• (C5H12): This is the molecular formula for pentane, which is an acyclic (straight-chain) hydrocarbon.
• (C4H10): This is the molecular formula for butane, another acyclic hydrocarbon.
• (C7H16): This is the molecular formula for heptane, which is also an acyclic hydrocarbon.

Q28. Answer: (b) 1951

The correct answer is 1951.

Key Points

• The Industries (Development and Regulation) Act was enacted in 1951 to regulate and develop industries in India.
• The Act provides the central government with the authority to take necessary steps for the development and regulation of industries.
• It aims to ensure balanced industrial development and prevent the concentration of economic power.
• The Act covers a wide range of industries and requires them to obtain licenses for operation.

Additional Information

• Industries (Development and Regulation) Act, 1951
• The Act was passed by the Parliament of India in 1951 to provide for the development and regulation of certain industries.
• It aims to control and regulate the pattern of industrial development and the licensing of industries.
• The Act grants the central government the power to make rules and regulations for the registration and licensing of industrial undertakings.
• It also provides for the establishment of advisory bodies to assist in the administration of the Act.
• Objectives of the Act
• To ensure a balanced and coordinated development of industries.
• To prevent the concentration of economic power in the hands of a few individuals or groups.
• To regulate the location of industries for the balanced regional development.
• To ensure the optimal utilization of national resources for industrial development.
• Licensing Provisions
• The Act mandates that certain industries must obtain licenses from the central government before commencing operations.
• Licenses are granted based on criteria such as location, technical feasibility, and financial soundness.
• The Act also provides for the revocation of licenses in cases of non-compliance with the terms and conditions.

Q29. Answer: (c) 67

The logic followed here is:

Hence, the correct answer is "67".

Q30. Answer: (d) S and T

Given:

Number of units of Q imported in 2016 = 32 lakhs

Number of units of R imported in 2016 = 28 lakhs

Imports of telephones in 2015:

P = 25 lakhs

Q = 28.5 lakhs

R = 30 lakhs

S = 34 lakhs

T = 26 lakhs

Formula used:

Average import of Q and R in 2016 = (Import of Q in 2016 + Import of R in 2016) / 2

Calculations:

=> Average import of Q and R in 2016 = (32 + 28) / 2 = 60 / 2 = 30 lakhs

Now, check pairs average given in options,

In 2015, the average import of P and Q = (25 + 28.5)/2 = 26.75 lakhs

In 2015, the average import of Q and R = (30 + 28.5)/2 = 29.75 lakhs

In 2015, the average import of R and S = (30 + 34)/2 = 32 lakhs

In 2015, the average import of S and T = (34 + 26)/2 = 30 lakhs

Therefore The average import of Q and R telephones in 2016 is equal to the average import of S and T type telephones in 2015.

Q31. Answer: (a) because there is no scattering of light

The correct answer is because there is no scattering of light.

Key Points

• In space, there is a vacuum, meaning there are no particles or atmosphere to scatter light.

• The scattering of light is what causes the sky to appear blue when viewed from Earth.

• Without scattering, light travels in straight lines, and the vast emptiness of space appears black.

• Photographs of Earth taken from space show a black background due to the absence of atmospheric particles that would scatter light.

Additional Information

• Scattering of Light:

• Scattering occurs when light rays encounter small particles in the atmosphere.

• The sky appears blue on Earth because molecules in the air scatter blue light from the sun more than they scatter red light.

• Rayleigh scattering is the dominant form of scattering in the Earth's atmosphere, which affects shorter wavelengths of light (blue and violet) more than longer wavelengths (red and orange).

• Refraction of Light:

• Refraction is the bending of light as it passes from one medium to another with different densities.

• This phenomenon is responsible for various optical effects, such as the bending of a straw in a glass of water.

• Reflection of Light:

• Reflection occurs when light bounces off a surface.

• It is the principle behind mirrors and shiny surfaces.

• Dispersion of Light:

• Dispersion is the separation of light into its component colors due to different degrees of refraction for different wavelengths.

• This phenomenon is observed in rainbows and prisms.

Q32. Answer: (a) ONLY WIN

Given: (left) BAT DIG FIT WIN (right)

According to the question:

Given words	BAT	DIG	FIT	WIN
'T' is added before each word	+T	+T	+T	+T
Resultant words	TBAT	TDIG	TFIT	TWIN
Required answer	Not a meaningful word	Not a meaningful word	Not a meaningful word	Meaningful word

Thus, according to the final arrangement, in only 'WIN' will form a meaningful English word if 'T' is added before the word.

Hence, "Option 1" is the correct answer.

Q33. Answer: (c) Rs. 25,000

Shortcut Trick

Savings % = 100% − Expenditure % = 100% − 80% = 20%

20% of Salary = Rs. 5,000

Salary (100%) = 5,000 × (100/20) = 5,000 × 5 = Rs. 25,000

Therefore The correct answer is Rs. 25,000.

Alternate Method

Given:

Spending = 80% of Salary

Monthly Savings = Rs. 5,000

Formula:

Salary = Expenditure + Savings

Calculations:

=> Let the total salary be x.
=> Savings = x − 80% of x = 20% of x
=> 20/100 × x = 5,000
=> 1/5 × x = 5,000
=> x = 5,000 × 5
=> x = 25,000
Therefore The correct answer is Rs. 25,000.
Additional Information
Percentage Change
Percentage increase or decrease is calculated as (Change / Original Value) × 100.
Income and Expenditure
Total Income is always the sum of total Expenditure and total Savings (Income = E + S).
Base Change Rule
If spending increases by x%, the savings must decrease by a corresponding amount if income remains constant.

Q34. Answer: (d) 1

Given Expression:
{1 + (1 - 2)^(-1) + 2 - (1 - 2)^(-2)}²
Simplification Steps:
=> Calculate (1 - 2)^(-1): (1 - 2) = -1 → (-1)^(-1) = -1
=> Calculate (1 - 2)^(-2): (1 - 2) = -1 → (-1)^(-2) = 1
=> Substituting back: {1 + (-1) + 2 - 1}
=> Simplifying: 1 - 1 + 2 - 1 = 1
=> Final calculation: {1}² = 1
Therefore The value of the expression is 1.

Q35. Answer: (c) 33 1/3 %

Shortcut Trick
Let the original selling price (SP1) be 100 units.
New selling price (SP2) = 60% of 100 = 60 units.
Loss is 20%, so SP2 = 80% of Cost Price (CP).
80% of CP = 60 => CP = (60 ÷ 80) × 100 = 75 units.
Profit at original SP = SP1 − CP = 100 − 75 = 25 units.
Profit% = (25 ÷ 75) × 100 = 100 ÷ 3 = 33 1/3 %.
Therefore The correct answer is 33 1/3 %.
Alternate Method
Given: New SP = 60% of Original SP; Loss at New SP = 20%.
Formulas: CP = [SP × 100] ÷ [100 − Loss%]; Profit% = [(SP − CP) ÷ CP] × 100.
=> Let Original Selling Price (S1) = x.
=> New Selling Price (S2) = 0.60x.
=> Loss = 20%, so Cost Price (CP) = S2 ÷ 0.80 = 0.60x ÷ 0.80 = 0.75x.
=> Profit at S1 = S1 − CP = x − 0.75x = 0.25x.
=> Profit% = (0.25x ÷ 0.75x) × 100 = 1/3 × 100 = 33 1/3 %.
Therefore The correct answer is 33 1/3 %.
Additional Information
Cost Price vs Selling Price
When Selling Price is greater than Cost Price, there is a profit. Profit% is always calculated on the Cost Price unless stated otherwise.
Relation between SP and CP
SP = CP × (100 ± Gain/Loss%) ÷ 100. This unitary relation helps in finding unknown price components quickly.

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Q36. Answer: (d) 65

Shortcut Trick

In a proportion a : b :: c : d, the product of extremes equals the product of means (ad = bc).

Given 13 : 12 :: x : 60

=> x = (13 × 60) ÷ 12

=> x = 13 × 5 = 65

Therefore The correct answer is 65.

Alternate Method

Given: 13 : 12 = x : 60

Formula Used: If a, b, c, d are in proportion, then a/b = c/d.

=> 13 / 12 = x / 60

=> 12 × x = 13 × 60

=> x = (13 × 60) / 12

=> x = 13 × 5

=> x = 65

Therefore The correct answer is 65.

Additional Information

Fourth Proportional

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

Mean Proportional

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

Third Proportional

If a : b :: b : c, then c is called the third proportional, and $c = b^2 / a$.

Q37. Answer: (c) N Chandrasekaran

The correct answer is N Chandrasekaran.

Key Points

• N Chandrasekaran was appointed as the Chairman of Air India in March 2022.

• He is also the Chairman of Tata Sons, the holding company and promoter of all Tata Group companies.

• Chandrasekaran has been instrumental in driving Tata Group's growth and transformation across various sectors.

• He took over as Chairman of Tata Sons in February 2017, and his tenure has been marked by significant strategic initiatives.

Additional Information

• Air India

• Air India is the flag carrier airline of India, headquartered in New Delhi.

• It was founded by J. R. D. Tata of Tata Sons in 1932 as Tata Airlines.

• After World War II, it became a public limited company and was renamed Air India.

• In January 2022, the Tata Group officially took over Air India from the Indian government, making it a private entity once again.

• Tata Sons

• Tata Sons is the holding company of the Tata Group, India's largest and oldest conglomerate.

• Founded in 1868 by Jamsetji Tata, the Tata Group operates in over 100 countries across six continents.

• Tata Sons is responsible for strategic leadership and management of various Tata companies.

• The group operates in diverse sectors such as IT, steel, automotive, consumer goods, telecommunications, and hospitality.

• N Chandrasekaran

• Natarajan Chandrasekaran, commonly known as N Chandrasekaran, is an Indian business executive.

• He served as the CEO and Managing Director of Tata Consultancy Services (TCS), India's largest IT services company, before becoming the Chairman of Tata Sons.

• Under his leadership, TCS saw significant growth and became one of the top IT services companies globally.

• Chandrasekaran is known for his strategic vision, leadership skills, and focus on innovation and customer-centricity.

• Tata Group's Acquisition of Air India

• The Tata Group's acquisition of Air India marked a significant milestone in Indian aviation history.

• It was a homecoming for Air India, as the airline was originally founded by the Tata Group.

• The acquisition is expected to bring synergies and operational efficiencies to Air India, leveraging Tata Group's expertise in

various sectors.

• The Tata Group plans to revamp Air India's operations, enhance customer experience, and expand its global footprint.

Q38. Answer: (d) SKF : WOJ

The logic followed here is:

DHP : HLT

MSO : QWS

Similarly,

SKF : WOJ

Hence, the correct answer is "SKF : WOJ".

Q39. Answer: (a) 73

Shortcut Trick

For any quadratic equation $ax^2 + bx + c = 0$, the discriminant (D) is calculated as $b^2 - 4ac$.

In the given equation $4x^2 - 5x - 3 = 0$, the coefficients are a = 4, b = −5, and c = −3.

Direct substitution: $D = (-5)^2 - 4 \times 4 \times (-3) = 25 + 48 = 73$.

Therefore The correct answer is 73.

Alternate Method

Given:

Quadratic equation: $4x^2 - 5x - 3 = 0$

Formula Used:

The standard form is $ax^2 + bx + c = 0$. The discriminant (D) is given by $D = b^2 - 4ac$.

Calculations:

Compare $4x^2 - 5x - 3 = 0$ with $ax^2 + bx + c = 0$:

=> a = 4

=> b = −5

=> c = −3

Substitute these values into the discriminant formula:

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

=> $D = 25 - (-48)$

=> $D = 25 + 48$

=> $D = 73$

Therefore The correct answer is 73.

Additional Information

Nature of Roots

If D > 0, the roots are real and distinct. If D = 0, the roots are real and equal. If D < 0, the roots are imaginary (complex).

Quadratic Formula

The roots of $ax^2 + bx + c = 0$ are given by $x = (-b \pm \sqrt{D}) \div 2a$, where D is the discriminant.

Sum and Product of Roots

Sum of roots $(\alpha + \beta) = -b \div a$ and Product of roots $(\alpha\beta) = c \div a$.

Q40. Answer: (c) 838/99

Shortcut Trick

To convert a recurring decimal like 8.4646... to a fraction:

Numerator = (Full number without decimal) − (Non-recurring part) = 846 − 8 = 838.

Denominator = Put as many 9s as there are repeating digits (two digits: 4 and 6) = 99.

Fraction = 838/99.

Therefore The correct answer is 838/99.

Alternate Method

Given: x = 8.464646...

Formula Used: Algebraic manipulation for repeating decimals.

=> Let x = 8.464646... —— (Equation 1)

=> Multiply both sides by 100 since two digits repeat.

=> 100x = 846.464646... —— (Equation 2)

=> Subtract (Equation 1) from (Equation 2):

=> 100x − x = 846.4646... − 8.4646...

=> 99x = 838

=> x = 838/99

Therefore The correct answer is 838/99.

Additional Information

Pure Recurring Decimal

A decimal in which all digits after the decimal point repeat, e.g., 0.333... = 3/9.

Mixed Recurring Decimal

A decimal in which some digits do not repeat, e.g., 0.1222... = (12−1)/90 = 11/90.

Conversion Rule

Denominator has as many 9s as repeating digits followed by as many 0s as non-repeating digits after the decimal.

Q41. Answer: (c) bitumen

The correct answer is bitumen.

Key Points

• Naphthalene balls are primarily composed of naphthalene, which is a polycyclic aromatic hydrocarbon.

• Naphthalene is obtained from the distillation of bitumen, a naturally occurring tar-like substance.

• Bitumen is also a byproduct of the petroleum refining process, where it is separated from crude oil.

• Bitumen is commonly used in the production of asphalt for road construction, but it also has other applications such as the manufacture of naphthalene balls.

Additional Information

• Naphthalene

• Naphthalene is a white crystalline solid with a strong mothball odor.

• It is mainly used as a precursor to other chemicals and as a moth repellent.

• It is volatile and sublimates easily, turning directly from a solid to a gas.

• Exposure to naphthalene can cause health issues such as respiratory problems and skin irritation.

• Bitumen

• Bitumen is a sticky, black, and highly viscous liquid or semi-solid form of petroleum.

• It is most commonly used in road construction due to its adhesive and waterproofing properties.

• Bitumen is also used in roofing, waterproofing, and sealing applications.

• The production of bitumen involves the distillation of crude oil, separating lighter fractions to leave a heavy residue.

• Petroleum Refining

• The process of refining petroleum involves separating crude oil into its various components based on boiling points.

• Major products of petroleum refining include gasoline, diesel, kerosene, and bitumen.

• Refining processes include distillation, cracking, reforming, and treating to produce various fuels and chemicals.

• Byproducts of refining, such as bitumen, are used in a variety of industrial applications.

Q42. Answer: (c) 8

Given Expression:

72 ÷ (9 – 7) of 3 - 6 × 2 + 8

Calculations:

=> Calculate inside the parentheses: 9 - 7 = 2

=> Substituting back: 72 ÷ 2 of 3 - 6 × 2 + 8

=> Interpret "of" as multiplication: 72 ÷ 6 - 6 × 2 + 8

=> Now Division will be performed: 12 - 6 × 2 + 8

=> Now we will multiply: 12 - 12 + 8

=> Now we get, 8

Therefore The value of the expression is 8.

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Q43. Answer: (c) 2

Shortcut Trick

By definition, a prime number is a positive integer greater than 1 that has no positive divisors other than 1 and itself.

Therefore, any prime number has exactly 2 factors: 1 and the number itself.

Therefore The correct answer is 2.

Alternate Method

Given: Any prime number.

Definition Used: A prime number p is a natural number greater than 1 whose only divisors are 1 and p.

Let us consider some examples of prime numbers:

=> For 2: The factors are 1 and 2 (Total = 2 factors)

=> For 3: The factors are 1 and 3 (Total = 2 factors)

=> For 5: The factors are 1 and 5 (Total = 2 factors)

=> For 7: The factors are 1 and 7 (Total = 2 factors)

=> Generally, for any prime number p, its factors are {1, p}.

=> Total number of factors = 2.

Therefore The correct answer is 2.

Additional Information

Composite Numbers

Numbers that have more than 2 factors are called composite numbers. For example, 4 has factors 1, 2, and 4 (3 factors).

The Number 1

The number 1 has only 1 factor (itself). Therefore, 1 is neither prime nor composite.

Even Prime Number

The number 2 is the smallest prime number and the only even prime number.

Q44. Answer: (b) Ethanol

The correct answer is Ethanol.

Key Points

• Ethanol, also known as ethyl alcohol, is a two-carbon molecule with the chemical formula C_2H_5OH.

• It is a common type of alcohol found in alcoholic beverages and is used as a solvent and in the manufacturing of various products.

• Ethanol is produced by the fermentation of sugars by yeasts or via petrochemical processes such as ethylene hydration.

• It is also used as a fuel additive in gasoline, known as bioethanol, to help reduce emissions.

Additional Information

• Lactic Acid

• Lactic acid is a three-carbon molecule with the chemical formula $C_3H_6O_3$.

• It is produced in muscle cells during intense exercise when oxygen levels are low, leading to anaerobic respiration.

• Lactic acid is also used in the food industry as a preservative and flavoring agent.

• Pyruvic Acid

• Pyruvic acid is a three-carbon molecule with the chemical formula $C_3H_4O_3$.

• It is an important intermediate in several metabolic pathways, including glycolysis and the citric acid cycle.

• Pyruvic acid can be converted into acetyl-CoA, lactate, or oxaloacetate depending on the cellular conditions.

• Glucose

• Glucose is a six-carbon molecule with the chemical formula $C_6H_{12}O_6$.

• It is a primary source of energy for cells and is involved in various metabolic processes.

• Glucose can be stored in the body as glycogen or converted into fats for long-term energy storage.

Q45. Answer: (d) 0

Shortcut Trick

Apply standard Trigonometric Identities directly: $\sin^2\theta + \cos^2\theta = 1$ and $\sec^2\theta - \tan^2\theta = 1$.

Simplify $\tan\theta \cos\theta$ as $(\sin\theta / \cos\theta) \times \cos\theta = \sin\theta$.

Substitute values: $1 - (1) + \sin\theta - \sin\theta = 0$.

Therefore The correct answer is 0.

Alternate Method

Given: $\sin^2\theta + \cos^2\theta - (\sec^2\theta - \tan^2\theta) + \tan\theta \cos\theta - \sin\theta$

Formula Used:

1. $\sin^2\theta + \cos^2\theta = 1$

2. $\sec^2\theta - \tan^2\theta = 1$

3. $\tan\theta = \sin\theta / \cos\theta$

Calculations:

=> Expression = $(\sin^2\theta + \cos^2\theta) - (\sec^2\theta - \tan^2\theta) + (\sin\theta / \cos\theta \times \cos\theta) - \sin\theta$

=> Expression = $1 - (1) + \sin\theta - \sin\theta$

=> Expression = $1 - 1 + 0$

=> Expression = 0

Therefore The correct answer is 0.

Additional Information

Pythagorean Identities

Fundamental relations in trigonometry: $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Reciprocal Identities

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

Q46. Answer: (a) 30°

Shortcut Trick

The sum of all exterior angles of any regular polygon is always 360°.

For a regular polygon with n sides, each exterior angle = 360° ÷ n.

Given n = 12.

=> Each exterior angle = 360° ÷ 12 = 30°.

Therefore The correct answer is 30°.

Alternate Method

Given:

Number of sides (n) = 12

Formula Used:

Measure of each exterior angle of a regular polygon = 360° ÷ n

Calculations:

=> Sum of all exterior angles = 360°

=> Number of sides (n) = 12

=> Each exterior angle = 360° ÷ 12

=> Each exterior angle = 30°

Therefore The correct answer is 30°.

Additional Information

Sum of Interior Angles

The sum of all interior angles of a polygon with n sides is given by $(n - 2) \times 180°$.

Interior Angle of a Regular Polygon

Each interior angle of a regular polygon is $[(n - 2) \times 180°] \div n$.

Interior and Exterior Angle Relation

At any vertex of a polygon, the sum of the interior angle and the exterior angle is always 180°.

Q47. Answer: (b) Bhopal

The correct answer is Bhopal.

Key Points

• India's first e-waste clinic has been established in Bhopal, the capital city of Madhya Pradesh.

• The clinic was inaugurated on 24 January 2020 to address the growing problem of electronic waste.

• The initiative is a collaborative effort between the Bhopal Municipal Corporation (BMC) and the Central Pollution Control Board (CPCB).

• The e-waste clinic is designed to segregate, process, and recycle electronic waste from both household and commercial sources.

Additional Information

• E-waste:

• Electronic waste (e-waste) consists of discarded electronic appliances such as computers, TVs, refrigerators, and mobile phones.

• E-waste contains toxic substances like lead, mercury, and cadmium, which can harm the environment and human health if not disposed of properly.

• Proper e-waste management involves the collection, transportation, recycling, and disposal of e-waste in a manner that minimizes its impact on the environment.

• Recycling e-waste helps recover valuable materials like gold, silver, and copper, reducing the need for new raw materials.

• Central Pollution Control Board (CPCB):

• The CPCB is a statutory organization under the Ministry of Environment, Forest, and Climate Change (MoEFCC), Government of India.

• It was established in 1974 under the Water (Prevention and Control of Pollution) Act, 1974.

• The CPCB provides technical services to the MoEFCC and coordinates activities related to the prevention and control of pollution.

• It also plays a key role in the formulation of national policies and standards for environmental protection and pollution control.

• Bhopal Municipal Corporation (BMC):

• The BMC is the governing body responsible for the civic infrastructure and administration of Bhopal city.

• It oversees various urban services, including waste management, water supply, road maintenance, and public health.

• The BMC collaborates with state and central government agencies to implement development projects and environmental initiatives.

• Establishing the e-waste clinic is part of BMC's efforts to promote sustainable waste management practices in the city.

Q48. Answer: (b) Zinc Sulphate

The correct answer is Zinc Sulphate.

Key Points

• When zinc metal is added to copper sulphate solution, a displacement reaction occurs because zinc is more reactive than copper.

• The chemical equation for this reaction is: Zn (s) + CuSO4 (aq) → ZnSO4 (aq) + Cu (s).

• In this reaction, zinc displaces copper from copper sulphate solution to form zinc sulphate and copper metal.

• This is an example of a single displacement reaction where a more reactive metal displaces a less reactive metal from its compound in an aqueous solution.

Additional Information

• Displacement Reaction:

• A displacement reaction is a type of chemical reaction in which an element reacts with a compound and takes the place of another element in that compound.

• In the case of copper sulphate and zinc, zinc displaces copper due to its higher reactivity.

• Reactivity Series:

• The reactivity series is a list of metals arranged in order of decreasing reactivity.

• Metals at the top of the series, like zinc, are more reactive and can displace metals below them, like copper, from their compounds.

• Copper Sulphate (CuSO4):

• Copper sulphate is a blue crystalline solid used in various applications such as agriculture, chemistry, and medicine.

• It is soluble in water and forms a blue solution used in chemical reactions and electroplating.

• Zinc Sulphate (ZnSO4):

• Zinc sulphate is a colorless, crystalline solid that is soluble in water.

• It is used in various industrial applications, including as a dietary supplement and in the production of rayon.

Q49. Answer: (d) To pass current through a coil wound around a soft iron core

The correct answer is To pass current through a coil wound around a soft iron core.

Key Points

• An electromagnet is created by passing an electric current through a coil of wire that is wound around a soft iron core.

• The soft iron core becomes magnetized when the current flows through the coil, enhancing the magnetic field produced by the coil.

• Electromagnets are temporary magnets, which means they only exhibit magnetic properties when an electric current is applied.

• Electromagnets can be turned on and off and their strength can be adjusted by changing the amount of electric current flowing through the coil.

Additional Information

• Electromagnetism

• Electromagnetism is the interaction of electric currents or fields and magnetic fields.

• It is one of the four fundamental forces of nature, along with gravity, weak nuclear force, and strong nuclear force.

• The field of electromagnetism studies the interactions between electrically charged particles and the electromagnetic fields they produce.

• Soft Iron Core

• A soft iron core is used in electromagnets to enhance the magnetic field generated by the coil.

• Soft iron is preferred because it has high magnetic permeability, allowing it to easily become magnetized and demagnetized.

• This property makes it ideal for applications where the magnetic field needs to be switched on and off frequently.

• Applications of Electromagnets

• Electromagnets are widely used in various applications such as electric bells, loudspeakers, relays, and magnetic cranes.

• They are also crucial components in many modern technologies, including MRI machines in medical imaging and particle accelerators in physics research.

• Adjusting Electromagnet Strength

• The strength of an electromagnet can be adjusted by changing the number of coils or the amount of current flowing through the coil.

• Increasing the number of coils or the current will increase the strength of the magnetic field.

• This property allows for precise control of the magnetic force exerted by the electromagnet.

Q50. Answer: (d) Alkaline

The correct answer is Alkaline.

Key Points

• Metal oxides generally react with acids to form salts and water, a characteristic behavior of alkaline substances.

• Most metal oxides dissolve in water to form metal hydroxides, which are basic (alkaline) in nature.

• Examples of alkaline metal oxides include sodium oxide (Na2O), potassium oxide (K2O), and calcium oxide (CaO).

• These alkaline oxides can neutralize acids, which is a fundamental property of bases.

Additional Information

• Oxides

• Oxides are compounds that contain at least one oxygen atom and one other element in their chemical formula.

• They can be classified into several types based on their acid-base properties: acidic oxides, basic oxides, amphoteric oxides, and neutral oxides.

• Acidic Oxides

• These oxides react with bases to form salt and water.

• Common examples include sulfur dioxide (SO2) and carbon dioxide (CO2).

• Amphoteric Oxides

• Amphoteric oxides can react with both acids and bases to form salts and water.

• Examples include aluminum oxide (Al2O3) and zinc oxide (ZnO).

• Neutral Oxides

• Neutral oxides do not exhibit acidic or basic properties.

• Examples include nitrous oxide (N2O) and carbon monoxide (CO).

Q51. Answer: (b) 1250

Shortcut Trick

Convert Speed to m/min: 10 km/h = (10 × 1000) ÷ 60 = 500/3 m/min.

Time = 7.5 minutes = 15/2 minutes.

Length = Speed × Time = (500/3) × (15/2) = 250 × 5 = 1250 m.

Therefore The correct answer is 1250 m.

Alternate Method

Given:

Speed = 10 km/h

Time = 7½ minutes = 15/2 minutes

Formula Used:

Distance = Speed × Time

Calculations:

=> Speed in m/s = 10 × (5/18) = 25/9 m/s

=> Time in seconds = (15/2) × 60 = 450 seconds

=> Length = (25/9) × 450

=> Length = 25 × 50 = 1250 m

Therefore The correct answer is 1250 m.

Additional Information

Unit Conversion

To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

Speed, Distance, Time Relation

Distance = Speed × Time | Time = Distance ÷ Speed | Speed = Distance ÷ Time.

Average Speed

Average Speed = Total Distance ÷ Total Time. For two equal distances at speeds a and b, Average Speed = 2ab ÷ (a + b).

Q52. Answer: (d) Untouchability

The correct answer is Untouchability.

Key Points

• Vijay Samarasya Yojana is specifically designed to eradicate untouchability in gram panchayats across Karnataka.

• The Karnataka government announced this awareness programme in March 2022.

• Untouchability is a social evil that has been prevalent in India for centuries, and this scheme aims to address and eliminate this discrimination at the grassroots level.

• The programme involves various awareness campaigns and activities to promote social harmony and equality among different communities.

Additional Information

• Untouchability

• Untouchability is a deeply rooted social practice in India that ostracizes a particular group of people, primarily Dalits, who are deemed "impure" by caste-based society.

• Despite being legally abolished by the Indian Constitution under Article 17, untouchability still exists in various forms across the country.

• Various government schemes and initiatives aim to eradicate this practice and promote social equality and justice.

• Awareness programs like Vijay Samarasya Yojana play a crucial role in changing societal attitudes and behaviors towards marginalized communities.

• Gram Panchayat

• A Gram Panchayat is the basic unit of local self-government in India's rural areas, functioning at the village or small town level.

• It comprises elected members and is responsible for the administration and development of the village, including implementing government schemes.

• The Gram Panchayat plays a crucial role in grassroots democracy and governance, ensuring that the needs and issues of rural populations are addressed.

• Social Harmony

• Social harmony refers to the peaceful and respectful coexistence of different social groups within a community or society.

• Promoting social harmony involves addressing and eliminating social prejudices, discrimination, and conflicts to create a more inclusive and equitable society.

• Government initiatives and awareness programs are essential tools in fostering social harmony, especially in diverse and multicultural societies like India.

Q53. Answer: (c) Rs. 2,25,392

Shortcut Trick

Interest for Year 1 = 2,20,000 × 8% = Rs. 17,600.

Principal for Year 2 = 2,20,000 − 27,600 = Rs. 1,92,400.

Interest for Year 2 = 1,92,400 × 8% = Rs. 15,392.

Total amount returned = Remaining Principal + Total Interest = 1,92,400 + (17,600 + 15,392) = Rs. 2,25,392.

Therefore The correct answer is Rs. 2,25,392.

Alternate Method

Given: Initial Principal (P) = Rs. 2,20,000 | Rate (R) = 8% | Year 1 Return = Rs. 27,600 (from principal).

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

=> Interest for the first year = (2,20,000 × 8 × 1) ÷ 100 = Rs. 17,600

=> Principal remaining after first year return = 2,20,000 − 27,600 = Rs. 1,92,400

=> Interest for the second year = (1,92,400 × 8 × 1) ÷ 100 = Rs. 15,392

=> Total Interest to be paid = 17,600 + 15,392 = Rs. 32,992

=> Total amount returned at the end of the second year = Remaining Principal + Total Interest

=> Amount = 1,92,400 + 32,992

=> Amount = Rs. 2,25,392

Therefore The correct answer is Rs. 2,25,392.

Additional Information

Simple Interest on Reduced Principal

When a part of the principal is repaid, the interest for the subsequent period is calculated only on the remaining balance principal.

Total Amount Formula

Total Amount (A) = Principal (P) + Simple Interest (SI). In installment cases, it is the sum of the last balance and all accrued interests.

Effective Rate of Interest

If payments are made periodically, the effective interest can be lower than the nominal rate calculated on the initial sum borrowed.

Q54. Answer: (c) 23

Given number: '31275848'

After arranged in descending order:

Digits	**3**	**1**	**2**	**7**	**5**	**8**	**4**	**8**
Descending order	8	8	7	5	4	3	2	1

Sum of the first 3 digits from the left end:

8 + 8 + 7 = 23

Hence, the correct answer is "Option 3".

Q55. Answer: (a) 0°

The correct answer is 0°.

Key Points

• According to Faraday's Law of Electromagnetic Induction, an emf is induced in a coil whenever there is a change in the magnetic flux linked with it.

• The induced emf is directly proportional to the rate of change of magnetic flux.

• When the direction of motion of the magnet is parallel to the plane of the coil (i.e., the angle between the direction of motion and the plane of the coil is 0°), the change in magnetic flux through the coil is minimum.

• Therefore, the induced current in the coil is also minimum.

• Hence, the correct answer is Option 1 – 0°.

Additional Information

• Faraday's First Law: An emf is induced in a circuit whenever the magnetic flux linked with it changes.

• Faraday's Second Law: The magnitude of the induced emf is proportional to the rate of change of magnetic flux.

• Maximum induced current is obtained when the magnet moves perpendicular to the plane of the coil (angle = 90°), as the rate of change of magnetic flux is maximum.

Important Points

• Minimum induced current: Motion of the magnet parallel to the plane of the coil (0°).

• Maximum induced current: Motion of the magnet perpendicular to the plane of the coil (90°).

Q56. Answer: (b) 5

Given series: 6 3 5 3 5 6 3 2 2 2 5 1 9 5 4 8 9 5 2 7

Numbers are there, each of which is immediately preceded by an odd number, and immediately followed by an even number.

Condition to be check:

• Odd number → Numbers → even number

6 3 5 3 5 6 3 2 2 2 5 1 9 5 4 8 9 5 2 7

Thus, 5 Numbers (3 5 6, 3 2 2, 9 5 4, 5 4 8, 9 5 2)) are there, each of which is immediately preceded by an odd number, and immediately followed by an even number.

Hence, the correct answer is "5".

Q57. Answer: (b) Only conclusion I and II follow

statement :

1. Some nails are rings.

2. All rings are fingers.

3. All nails are bracelets.

The least possible Venn diagram is:

conclusion :

(I) Some bracelets are rings. - True (Because Some nails are rings and All nails are bracelets so, Some bracelets are also rings)

(II) Some fingers are nails. - True (Because Some nails are rings and All rings are fingers so, Some fingers are also nails)

(III) No ring is a bracelet. - False ((Because Some nails are rings and All nails are bracelets so, Some rings are bracelets)

So, Only conclusion I and II follow.

Hence, the correct answer is "Only conclusion I and II follow".

Q58. Answer: (c) Buddhism

The correct answer is Buddhism.

Key Points

• Beshak is a festival celebrated by Buddhists to commemorate the birth, enlightenment, and death of Gautama Buddha.

• This festival is observed on the full moon day of the lunar month Vaisakha, which usually falls in April or May.

• Beshak is one of the most significant festivals in Buddhism, with celebrations involving prayers, meditation, and various cultural activities.

• It is also known as Vesak or Buddha Purnima in different regions and is celebrated with great fervor in countries with significant Buddhist populations.

Additional Information

• Vaisakha

• Vaisakha is the second month in the Hindu calendar, corresponding to April-May in the Gregorian calendar.

• It is considered an auspicious month and is associated with various festivals and religious events in Hinduism, Buddhism, and Jainism.

• Full Moon Day

• The full moon day, known as Purnima in Sanskrit, is considered sacred in many cultures and religions.

• It marks the day when the moon is completely illuminated and is often associated with important religious observances and festivals.

• Gautama Buddha

• Gautama Buddha, also known as Siddhartha Gautama, was the founder of Buddhism.

• Born in Lumbini (modern-day Nepal) around the 5th century BCE, he attained enlightenment under the Bodhi tree in Bodh Gaya, India.

• His teachings form the foundation of Buddhist philosophy, emphasizing the Four Noble Truths and the Eightfold Path.

• Vesak

• Vesak, also known as Buddha Purnima or Buddha Jayanti, is a major Buddhist festival commemorating the birth, enlightenment, and death of Gautama Buddha.

• It is celebrated with various activities such as prayers, meditation, chanting, and cultural performances.

• Vesak is an occasion for Buddhists to reflect on the teachings of the Buddha and engage in acts of kindness and charity.

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Q59. Answer: (d) Helping every drop of rain seep into the ground

The correct answer is Helping every drop of rain seep into the ground.

Key Points

• The primary purpose of rainwater harvesting is to capture and store rainwater for future use, thereby reducing the runoff and wastage of rainwater.

• This technique helps in recharging the groundwater levels by allowing water to seep into the ground.

• Rainwater harvesting can help in reducing dependence on municipal water supply by providing an alternative source of water for various uses.

• It is an eco-friendly and sustainable method to manage and conserve water resources, especially in areas experiencing water scarcity.

Additional Information

• Rainwater Harvesting:

• Rainwater harvesting is the process of collecting and storing rainwater for later use. It involves the capture of rainwater from surfaces such as rooftops and other hard surfaces.

• The collected water can be used for various purposes including irrigation, gardening, washing, and even drinking after proper treatment.

• It is particularly beneficial in areas with irregular rainfall patterns or where the groundwater levels are depleting.

• Rainwater harvesting systems can range from simple designs like barrels to more complex systems involving pumps, tanks, and filtration systems.

• Groundwater Recharge:

• Groundwater recharge is the process of water seeping into the ground and replenishing the groundwater levels.

• This is a critical process for maintaining the water table and ensuring a sustainable supply of groundwater for various uses.

• Rainwater harvesting plays a significant role in enhancing groundwater recharge, especially in urban areas where natural percolation is reduced due to paved surfaces.

• Techniques such as recharge pits, trenches, and permeable pavements can be used to facilitate groundwater recharge.

• Water Conservation:

• Water conservation involves the careful use and management of water resources to ensure their sustainability for future generations.

• Practices such as rainwater harvesting, efficient irrigation methods, and reducing water wastage are important aspects of water conservation.

• Water conservation helps in mitigating the effects of droughts, reducing the burden on water supply systems, and preserving the natural ecosystem.

• Public awareness and education on water conservation practices are essential for promoting sustainable water use.

• Municipal Water Supply:

• Municipal water supply refers to the provision of water by local government authorities to urban and rural households and businesses.

• This water is typically sourced from rivers, lakes, reservoirs, or groundwater and treated to meet safety standards before distribution.

• Dependence on municipal water supply can be high in urban areas, leading to stress on water resources, especially during periods of low rainfall or drought.

• Rainwater harvesting can supplement municipal water supply and reduce the pressure on these centralized systems.

Q60. Answer: (c) 5

According to the given information:

Thus, 5 people are politicians as well as authors but do not have post graduate degree.

Hence, the correct answer is "5".

Q61. Answer: (b) Solid

The correct answer is Solid.

Key Points

• A precipitate is a solid that forms out of a solution during a chemical reaction.

• Precipitates are formed when two soluble substances react and produce an insoluble product.

• The solid precipitate can be separated from the liquid components by filtration or decantation.

• Precipitation reactions are used in qualitative inorganic analysis to identify the presence of specific ions in a solution.

Additional Information

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• Precipitation Reaction

• A precipitation reaction occurs when cations and anions in aqueous solution combine to form an insoluble ionic solid called a precipitate.

• For example, when solutions of silver nitrate ($AgNO_3$) and sodium chloride (NaCl) are mixed, the precipitate of silver chloride (AgCl) forms:

• $AgNO_3(aq) + NaCl(aq) \rightarrow AgCl(s) + NaNO_3(aq)$

• Filtration

• Filtration is a process used to separate solids from liquids or gases using a filter medium that allows only the fluid to pass through.

• The solid that remains on the filter is called the residue, and the liquid that passes through is called the filtrate.

• Decantation

• Decantation is a process of separating mixtures by removing a liquid layer that is free of precipitate or sediment.

• This technique is used to separate a liquid from insoluble solids or from immiscible liquids with different densities.

• Qualitative Inorganic Analysis

• This is a branch of analytical chemistry that seeks to determine the elemental composition of inorganic compounds.

• Qualitative analysis involves identifying the ions present in a sample through specific reactions that produce visible changes, such as precipitate formation.

Q62. Answer: (a) North-East

According to the given information:

Thus, city C is located in North-East direction with respect to city Z.

Hence, the correct answer is "North-East".

Q63. Answer: (a) 40 m

According to the given information:

Thus, the value of Y = 15 + 25 = 40 m.

Hence, the correct answer is "40 m".

Q64. Answer: (d) Andhra Pradesh

The correct answer is Andhra Pradesh.

Key Points

• Shri Bhagawan Mahaveer Government Museum is located in Cuddapah, Andhra Pradesh.

• It was established in the year 1982.

• The museum showcases various artifacts, sculptures, and historical items significant to the region's cultural heritage.

• The museum is managed by the Department of Archaeology and Museums, Government of Andhra Pradesh.

Additional Information

• Andhra Pradesh

• Andhra Pradesh is a state in the southeastern coastal region of India.

• It is the seventh-largest state by area and the tenth-most populous state in India.

• The state has a rich cultural heritage, with historical sites, temples, and museums.

• Some notable places include the Tirupati Temple, Amaravati Stupa, and the Borra Caves.

• Department of Archaeology and Museums, Government of Andhra Pradesh

• This department is responsible for the preservation, conservation, and promotion of the cultural heritage of Andhra Pradesh.

• It manages various museums, historical sites, and monuments in the state.

• They conduct archaeological excavations and research to uncover and protect historical artifacts.

• The department also organizes exhibitions and educational programs to raise awareness about the state's cultural heritage.

• Cuddapah

• Cuddapah, also known as Kadapa, is a city in the Rayalaseema region of the Indian state of Andhra Pradesh.

• It is known for its rich history and cultural significance.

• The city has several historical landmarks, including temples, forts, and museums.

• It serves as an important cultural and educational center in the region.

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Q65. Answer: (d) Friday

Given: 5th March 2009 was Thursday.

Now,

2009 to 2016 = 7 Years (5 Ordinary Years and 2 Leap Years).

And, In 7 Years = 2 Leap Years and 5 Ordinary Years.

So, 2 Leap Years have 4 odd days,

And, 5 Ordinary Years have 5 odd days.

Total odd days = 4 + 5 = 9.

9 odd days → 9/7 = 1 week and 2 odd days.

then, 5th March 2016 will be Thursday + 2 = Saturday.

Now, the number of days between 5th March 2016 to 11th March 2016 = 6 days.

So, 11th March 2016 will be Saturday + 6 = Friday.

Hence, the correct answer is "Option 4".

Q66. Answer: (d) • and -

Given equation: 28 ÷ 4 - 12 × 5 + 11 = 56

Option 1) ÷ and -

After interchanging the signs we get:

=> 28 - 4 ÷ 12 × 5 + 11 = 56

=> 28 - 1.67 + 11 = 56

=> 39 - 1.67 = 56

=> 38.67 = 56

Option 2) × and +

After interchanging the signs we get:

=> 28 ÷ 4 - 12 + 5 × 11 = 56

=> 7 - 12 + 5 × 11 = 56

=> 7 - 12 + 55 = 56

=> 62 - 12 = 56

=> 50 = 56

Option 3) × and ÷

After interchanging the signs we get:

=> 28 × 4 - 12 ÷ 5 + 11 = 56

=> 28 × 4 - 2.4 + 11 = 56

=> 112 - 2.4 + 11 = 56

=> 123 - 2.4 = 56

=> 120.6 = 56

Option 4) + and -

After interchanging the signs we get:

=> 28 ÷ 4 + 12 × 5 - 11 = 56

=> 7 + 12 × 5 - 11 = 56

=> 7 + 60 - 11 = 56

=> 67 - 11 = 56

=> 56 = 56

Hence, the correct answer is "+ and -".

Q67. Answer: (d) gastric juice

The correct answer is gastric juice.

Key Points

• Gastric juice has a pH value of around 1.5 to 3.5, which is significantly lower than that of pure water.

• Pure water has a neutral pH of 7.

• The low pH of gastric juice is due to the presence of hydrochloric acid (HCl), which aids in digestion.

• The acidic environment in the stomach helps to break down food and kill harmful bacteria.

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Additional Information

• pH Scale

• The pH scale measures how acidic or basic a substance is, ranging from 0 to 14.

• A pH of 7 is neutral, below 7 is acidic, and above 7 is basic (alkaline).

• Hydrochloric Acid (HCl)

• Hydrochloric acid is a strong acid found in gastric juice.

• It is produced by the parietal cells in the stomach lining.

• HCl plays a crucial role in digestion by breaking down food and activating digestive enzymes.

• Milk of Magnesia

• Milk of magnesia is a common over-the-counter medication, primarily used as an antacid and laxative.

• It has a basic pH of around 10.5, which helps neutralize stomach acid.

• NaOH (Sodium Hydroxide)

• NaOH, commonly known as lye or caustic soda, is a strong base with a pH value of around 14.

• It is used in various industrial and chemical processes.

• NH4OH (Ammonium Hydroxide)

• Ammonium hydroxide is a solution of ammonia in water and has a basic pH of around 11.

• It is commonly used as a cleaning agent and in various industrial applications.

Q68. Answer: (a) electric generator

The correct answer is electric generator.

Key Points

• An electric generator is a device that converts mechanical energy into electrical energy based on the principle of electromagnetic induction.

• Unlike devices such as electric kettles, bulbs, and ovens, which rely on the heating effect of electric current to function, electric generators do not produce heat as a primary function.

• Electric generators use mechanical movement, often produced by engines or turbines, to create a flow of electric charge through a conductor.

• The primary purpose of an electric generator is to supply power, often for homes, industries, or to charge batteries, rather than producing heat.

Additional Information

• Electric Kettle

• An electric kettle is an appliance that heats water using electric current. It operates based on the heating effect of electric current, where the current passes through a heating element, converting electrical energy into heat energy.

• This heat energy is then used to boil water.

• Electric Bulb

• An electric bulb, particularly an incandescent bulb, works by passing electric current through a filament, which heats up and produces light.

• The filament's heating is a result of the heating effect of electric current.

• Oven

• An electric oven uses heating elements to cook food. The heating elements convert electrical energy into heat energy through the heating effect of electric current.

• The heat generated is used for baking, roasting, and other cooking processes.

• Electric Generator

• An electric generator converts mechanical energy into electrical energy using electromagnetic induction.

• It consists of a rotor (the rotating part) and a stator (the stationary part).

• When the rotor spins, it induces a flow of electric current within the stator's coils.

• This principle is utilized in various applications, including power generation in power plants and portable generators.

Q69. Answer: (b) (11, 330, 10)

The logic followed here is:

Logic: 1st number × 3rd number × 3 = 2nd number.

Now,

For, (15, 450, 10)

=> (15 × 10 × 3) = 450.

For, (12, 540, 15)

=> (12 × 15 × 3) = 540.

Similarly, for (11, 330, 10)

=> (11 × 10 × 3) = 330.

Hence, the correct answer is "Option 2".

Q70. Answer: (b) VDFUT

Given:

Numbers/Symbols	**4**	**&**	**5**	**^**	**8**	**@**	**2**	**6**	**%**	**$**	**9**	**5**	**3**	**#**
code letter	G	B	H	T	V	M	A	K	L	D	F	E	Q	U

Then, the code for ^ $ 9 # 8 => TDFUV

Terms :

(i) If the first component is a symbol and the last component is a number, then the codes of both these (first and last components) are to be interchanged.

So, the code for ^ and 8 = V and T

Now, the final code for ^ $ 9 # 8 => VDFUT.

Hence, the correct answer is "VDFUT".

Q71. Answer: (b) (4x - 2y - 5z) ²

Shortcut Trick

Identify the squared terms: $(4x)^2$, $(2y)^2$, and $(5z)^2$.

Analyze the signs of the mixed terms: $-16xy$, $+20yz$, and $-40zx$.

Since the product yz is positive, y and z must have the same sign (both negative or both positive).

Since xy and zx are negative, x must have the opposite sign to y and z.

Using positive x and negative y and z, we get the combination $(4x - 2y - 5z)$.

Therefore The correct answer is $(4x - 2y - 5z)^2$.

Alternate Method

Given Expression: $16x^2 + 4y^2 + 25z^2 - 16xy + 20yz - 40zx$

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

Calculations:

=> Compare the given expression with the algebraic identity formula.

=> $a^2 = 16x^2 \rightarrow a = 4x$

=> $b^2 = 4y^2 \rightarrow b = -2y$ (Chosen negative to satisfy the $-16xy$ term)

=> $c^2 = 25z^2 \rightarrow c = -5z$ (Chosen negative to satisfy the $+20yz$ term when multiplied by $-2y$)

=> Verify the cross-product terms:

=> $2ab = 2 \times (4x) \times (-2y) = -16xy$

=> $2bc = 2 \times (-2y) \times (-5z) = +20yz$

=> $2ca = 2 \times (-5z) \times (4x) = -40zx$

=> Since all terms match, the expression is the perfect square of $(4x - 2y - 5z)$.

Therefore The correct answer is $(4x - 2y - 5z)^2$.

Additional Information

Square of a Trinomial

The expansion of $(a + b + c)^2$ always results in six terms: the sum of the squares of each term plus twice the product of each pair of terms.

Sign Convention in Identities

When factorizing, look for the variable common to two negative terms; that variable often has the opposite sign to the others in the square root expression.

Perfect Square Trinomials

An expression like $x^2 \pm 2xy + y^2$ is a perfect square $(x \pm y)^2$, which is a specific case of the multi-variable trinomial identity.

Q72. Answer: (c) 40

Given:

The following distribution shows the mean literacy rate of some cities:

Literacy Rate in %	Number of Cities
25 - 35	6
35 - 45	5
45 - 55	4
55 - 65	1

Calculations:

Step 1: Calculate the Midpoint for Each Class Interval

Literacy Rate (%)	Midpoint	Number of Cities	Midpoint × Number of Cities
25 - 35	30	6	180
35 - 45	40	5	200
45 - 55	50	4	200
55 - 65	60	1	60

Step 2: Total Values

Total Number of Cities = 6 + 5 + 4 + 1 = 16

Total of Midpoint × Number of Cities = 180 + 200 + 200 + 60 = 640

Step 3: Calculate the Mean

Mean = 640/16 = 40

Therefore The mean literacy rate of the cities is 40%.

Q73. Answer: (a) H

Given series: (left) V 2 5 @ ρ 9 W ¥ # 2 Ω RQ 1 @ FB 4 # H 6 J % Y 3 Z (right)

After removing all the numbers:

(left) V @ ρ W ¥ # Ω R Q @ F B # H J % Y Z (right)

Fifth place from the right end is: H

Hence, the correct answer is "Option 1".

Q74. Answer: (d) S

Given: Eight persons L, M, N, O, P, Q, R and S were sitting around a square table facing the centre.

1) P was sitting fourth to the left of Q.

2) Only O was sitting between M and Q.

3) N was sitting immediate right of L.

4) R was sitting immediate left of M.

5) L and P were sitting at the corners.

Thus, the final arrangement:

So, S was sitting fourth to the left of R.

Hence, the correct answer is "S".

Q75. Answer: (b) G > E

Given Statement: E < H < K = G > F > D

Now,

Conclusions:

Option 1: D > G → False (G > F > D It gives G > D)

Option 2: G > E → True (E < H < K = G It gives G > E)

Option 3: K < E → False (K = G > E It gives K > E)

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Option 4: K < D → False (K = G > F > D It gives K > D)

Hence, the correct answer is "Option 2".

Q76. Answer: (c) 1,960

Shortcut Trick

Loss of 30% means the Selling Price is 70% of the Cost Price.

Multiplier SP = CP × (100 − Loss%) ÷ 100

SP = 2,800 × (70 ÷ 100) = 2,800 × 0.7

SP = 1,960

Therefore The correct answer is Rs. 1,960.

Alternate Method

Given → Cost Price (CP) = Rs. 2,800, Loss Percentage = 30%.

Formulas: Loss = (Loss% ÷ 100) × CP | SP = CP − Loss

→ Step 1: Calculate the amount of Loss.

→ Loss = (30 ÷ 100) × 2,800 = 0.3 × 2,800 = 840.

→ Step 2: Calculate the Selling Price (SP).

→ SP = CP − Loss = 2,800 − 840 = 1,960.

Therefore The correct answer is Rs. 1,960.

Additional Information

Cost Price & Selling Price

Cost Price (CP) is the price at which an item is bought. Selling Price (SP) is the price at which it is sold. If CP > SP, there is a Loss.

Loss Percentage Formula

Loss% = [(CP − SP) ÷ CP] × 100. This percentage is always calculated on the Cost Price unless stated otherwise.

Q77. Answer: (d) Antimony

The correct answer is Antimony.

Key Points

• Antimony (Sb) is an element that exhibits properties of both metals and non-metals, categorizing it as a metalloid.

• It is found in nature mainly as the sulfide mineral stibnite (Sb2S3).

• Antimony has applications in flame-proofing materials, paints, ceramics, and alloys for batteries.

• It is used in semiconductors and other electronic devices due to its unique electrical properties.

Additional Information

• Metalloids

• Metalloids are elements that have properties intermediate between those of metals and non-metals.

• They are also known as semimetals.

• Commonly recognized metalloids include boron, silicon, germanium, arsenic, antimony, and tellurium.

• These elements often display semiconductive properties, making them valuable in the electronics industry.

• Properties of Metalloids

• Metalloids typically have a metallic appearance but are brittle and not malleable.

• They can form alloys with metals and can also form compounds with non-metals.

• They often exhibit intermediate electrical conductivity which can be modified by introducing impurities.

• Due to their semiconductive properties, they are crucial in the manufacturing of electronic components such as diodes and transistors.

• Applications of Antimony

• Antimony is used in lead-acid batteries to improve plate strength and corrosion resistance.

• It is a component in flame retardants for textiles, plastics, and other materials.

• Antimony compounds are used in the production of paints and ceramics.

• Its semiconductive properties make it useful in the electronics industry for making diodes and infrared detectors.

• Other Elements in the Options

• Bismuth: A metal known for its low toxicity and high density, used in pharmaceuticals and cosmetics.

• Iron: A metal primarily used in construction and manufacturing due to its strength and abundance.

• Selenium: A non-metal used in glassmaking and as a dietary supplement due to its antioxidant properties.

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Q78. Answer: (d) Nichrome

The correct answer is Nichrome.

Key Points

• Nichrome is an alloy made primarily of nickel, chromium, and often iron.

• It is known for its high resistance to oxidation and stable resistance over a wide range of temperatures.

• Nichrome does not react with oxygen at high temperatures, making it ideal for use in heating elements and resistance wires.

• Its high melting point and durability under high temperatures make it resistant to degradation in high-temperature environments.

Additional Information

• Oxidation

• Oxidation is a chemical reaction that occurs when a substance combines with oxygen, often producing energy in the form of heat and light.

• Metals such as iron, copper, and aluminum readily oxidize, forming oxides.

• Oxidation can lead to corrosion, which is the gradual destruction of materials by chemical reactions with environmental elements.

• High-Temperature Reactions

• At high temperatures, many materials can undergo chemical reactions that they would not at lower temperatures.

• For metals, this often means reacting with oxygen to form metal oxides.

• High-temperature stability is crucial for materials used in furnaces, heating elements, and other high-heat applications.

• Resistance Alloys

• Resistance alloys are metals designed to have a high electrical resistance, which makes them useful in applications where heat generation is required.

• Nichrome is one of the most well-known resistance alloys, used extensively in heating elements for electric ovens, toasters, and hair dryers.

Q79. Answer: (d) 2

The correct answer is 2.

Key Points

• Yajurveda is one of the four Vedas, the ancient texts of Hinduism.

• There are two primary branches (Shakhas) of Yajurveda: Shukla (White) Yajurveda and Krishna (Black) Yajurveda.

• Shukla Yajurveda is also known as Vajasaneyi Samhita, and it is further divided into Madhyandina and Kanva Shakhas.

• Krishna Yajurveda contains mixed prose and verses and is further divided into Taittiriya, Maitrayani, Kathaka, and Kapisthala-Katha Samhitas.

Additional Information

• Yajurveda

• Yajurveda is one of the four Vedas, which also include Rigveda, Samaveda, and Atharvaveda.

• The Yajurveda is primarily a compilation of ritual offering formulas that were said by a priest while an individual performed ritual actions such as those before the yajna fire.

• It is divided into two major recensions known as the "black" (Krishna) and the "white" (Shukla) Yajurveda.

• Shukla Yajurveda, or White Yajurveda, contains only the mantras, while Krishna Yajurveda, or Black Yajurveda, has a mixture of prose and verses.

• Shukla Yajurveda

• Also known as Vajasaneyi Samhita.

• It is divided into Madhyandina and Kanva Shakhas.

• Each of these branches has its own unique set of mantras and verses.

• Krishna Yajurveda

• Contains a mixture of prose and verses.

• It is further divided into Taittiriya Samhita, Maitrayani Samhita, Kathaka Samhita, and Kapisthala-Katha Samhita.

• Each of these Samhitas has its own unique characteristics and content.

• Significance of Yajurveda

• Yajurveda plays a crucial role in Vedic rituals and ceremonies.

• It is used by the Adhvaryu priest, who is responsible for the physical details of the rituals, including the measurements and construction of the altar and other ritual implements.

• The mantras of Yajurveda are recited in conjunction with the performances of various sacrificial rites.

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Q80. Answer: (d) Halo Compound

The correct answer is Halo Compound.

Key Points

• Halo compounds are a class of organic compounds that contain halogen atoms.

• These compounds do not contain any oxygen atoms in their structure.

• Halogen atoms such as fluorine, chlorine, bromine, and iodine are part of these compounds.

• Halo compounds are also known as halides or alkyl halides depending on their structure.

Additional Information

• Carboxylic Acid:

• Carboxylic acids are organic compounds containing a carboxyl group (COOH).

• Their general formula is R-COOH, where R is an alkyl or aryl group.

• Carboxylic acids are known for their acidic properties due to the hydrogen in the carboxyl group.

• Examples include acetic acid (vinegar) and citric acid (found in citrus fruits).

• Ketones:

• Ketones are organic compounds characterized by a carbonyl group (C=O) bonded to two carbon atoms.

• The general formula for ketones is RC(=O)R', where R and R' can be the same or different alkyl or aryl groups.

• Ketones are widely used as solvents and in the production of various chemicals.

• Common examples include acetone and butanone.

• Esters:

• Esters are organic compounds derived from carboxylic acids and alcohols.

• The general formula for esters is RCOOR', where R and R' are alkyl or aryl groups.

• Esters are known for their pleasant fragrances and are used in perfumes and flavorings.

• Examples include ethyl acetate and methyl butanoate.

Q81. Answer: (d) Malwa Plateau

The correct answer is Malwa Plateau.

Key Points

• The Malwa Plateau is located in the central-western part of India, primarily spread over the states of Rajasthan, Madhya Pradesh, and Gujarat.

• It has an average elevation of around 500 meters above sea level, making it a significant geographic feature in the region.

• The plateau is known for its rich black soil, which is highly fertile and suitable for agriculture, especially the cultivation of crops like cotton and soybeans.

• The region is also known for its historical significance and houses several important archaeological sites and cultural heritage landmarks.

Additional Information

• Marwar Plateau

• Also known as the Marusthali region, it is located in the western part of Rajasthan.

• It is characterized by sandy and rocky terrain with an arid climate.

• The plateau is part of the Thar Desert and is not as elevated as the Malwa Plateau.

• Deccan Plateau

• This plateau covers a large part of southern India, extending across multiple states like Maharashtra, Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu.

• It has an average elevation of about 600 meters above sea level and is known for its volcanic basalt rock formations.

• The Deccan Plateau is different from the Malwa Plateau in terms of geological formation and climatic conditions.

• Chota Nagpur Plateau

• Located in eastern India, it spans across the states of Jharkhand, West Bengal, Bihar, and Odisha.

• It is rich in mineral resources like coal, iron ore, and bauxite.

• The Chota Nagpur Plateau has a rugged terrain with an average elevation of around 700 meters.

Q82. Answer: (c) 420

Shortcut Trick

Identify the highest common factor (HCF) which is 14.

Divide the numbers by 14: 70/14 = 5, 28/14 = 2, 42/14 = 3.

The LCM is 14 × 5 × 2 × 3 = 420.

Therefore The correct answer is 420.

Alternate Method

Given: Numbers are 70, 28, and 42.

Formula Used: Prime Factorization Method or Common Division Method.

=> Prime factors of 70 = 2 × 5 × 7

=> Prime factors of 28 = 2^2 × 7

=> Prime factors of 42 = 2 × 3 × 7

=> LCM = Highest power of all prime factors = 2^2 × 3 × 5 × 7

=> LCM = 4 × 3 × 5 × 7 = 420

Therefore The correct answer is 420.

Additional Information

LCM and HCF Relationship

For any two numbers 'a' and 'b', the product of the numbers is equal to the product of their HCF and LCM: a × b = HCF(a, b) × LCM(a, b).

LCM of Fractions

LCM of fractions = (LCM of Numerators) ÷ (HCF of Denominators).

Co-prime Numbers

The LCM of two co-prime numbers is always equal to their product since their HCF is 1.

Q83. Answer: (d) 60

Shortcut Trick

Net work rate = (1/15) − (1/20)

Product-Difference Formula: Time = (A × B) ÷ (B − A)

Time = (15 × 20) ÷ (20 − 15) = 300 ÷ 5 = 60 minutes.

Therefore The correct answer is 60 minutes.

Alternate Method

Given: Filling time = 15 minutes, Emptying time = 20 minutes.

Formula Used: Total Work = LCM of time; Efficiency = Work ÷ Time.

Pipe	Time (min)	Total Capacity	Efficiency
Inlet Pipe	15	60 units	+4
Outlet Pipe	20	−3	

=> Net Efficiency = 4 − 3 = 1 unit/minute

=> Time required = Total Capacity ÷ Net Efficiency

=> Time required = 60 ÷ 1 = 60 minutes

Therefore The correct answer is 60 minutes.

Additional Information

Inlet and Outlet Concept

An Inlet pipe performs positive work (filling), while an Outlet pipe performs negative work (emptying) relative to the tank capacity.

Combined Rate Formula

If pipe A fills in 'x' hours and pipe B empties in 'y' hours, the net time taken is xy ÷ (y − x), provided y > x.

Pipes & Cisterns Logic

This topic follows the same principles as Time and Work, where the volume of the tank is treated as the total units of work to be completed.

Q84. Answer: (c) W > Z

Given Statement: A ≥ Q > z ≤ S = O < W

Now,

Conclusions:

Option 1: Q > O → True (Q > z ≤ S = O It gives Q > O)

Option 2: A > O → True (A ≥ Q > z ≤ S = O It gives A ≥ O, A > O)

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Option 3: W > Z → True (z ≤ S = O < W It gives W > z)

Option 4: W ≥ A → False (A ≥ Q > z ≤ S = O < W It doesn't necessarily give W ≥ A)

Hence, the correct answer is "Option 3".

Q85. Answer: (d) Delhi

The correct answer is Delhi.

Key Points

• The Delhi government's Women and Child Development (WCD) department implemented a policy in July 2021 to identify and rehabilitate destitute children.

• The policy assigns the responsibility of identifying and rehabilitating destitute children to 10 of its agencies.

• These agencies include the Child Welfare Committees (CWCs), District Child Protection Units (DCPUs), and various NGOs working for child welfare.

• The initiative aims to provide a safe environment and necessary resources for the overall development and well-being of destitute children in Delhi.

Additional Information

• Women and Child Development (WCD) Department

• The Women and Child Development (WCD) department is responsible for the development and protection of women and children in the state.

• It implements various schemes and programs aimed at improving the health, education, and social status of women and children.

• The department works closely with other governmental and non-governmental organizations to ensure effective implementation of its policies.

• Child Welfare Committees (CWCs)

• Child Welfare Committees (CWCs) are statutory bodies constituted under the Juvenile Justice (Care and Protection of Children) Act, 2015.

• They are responsible for ensuring the care, protection, treatment, and rehabilitation of children in need of care and protection.

• CWCs have the authority to make decisions regarding the placement and welfare of such children.

• District Child Protection Units (DCPUs)

• District Child Protection Units (DCPUs) are established at the district level to implement child protection policies and programs.

• DCPUs coordinate with various stakeholders, including CWCs, NGOs, and law enforcement agencies, to ensure the safety and well-being of children.

• They also conduct awareness programs and provide support services to children and their families.

• Non-Governmental Organizations (NGOs)

• NGOs play a crucial role in the implementation of child welfare programs by providing on-ground support and resources.

• They work in collaboration with government agencies to identify, rescue, and rehabilitate destitute children.

• NGOs also provide educational, health, and vocational training services to help children lead a better life.

Q86. Answer: (d) Nanaji Deshmukh National Gaurav Gram Sabha Award (NDRGGSP)

The correct answer is Nanaji Deshmukh National Gaurav Gram Sabha Award (NDRGGSP).

Key Points

• The Nanaji Deshmukh National Gaurav Gram Sabha Award (NDRGGSP) is given to Gram Panchayats/Gram Parishads for their outstanding contribution to socio-economic development.

• This award recognizes the effective functioning of Gram Sabhas, which are village councils in India.

• It promotes the involvement of village councils in the decision-making process, ensuring community participation in governance.

• Named after Nanaji Deshmukh, a social activist and a Padma Vibhushan awardee, this award encourages grassroots democracy and decentralized planning.

Additional Information

• Gram Panchayat Development Plan Award (GPDPA)

• This award is given for the effective preparation and implementation of Gram Panchayat Development Plans.

• It aims to incentivize panchayats to focus on comprehensive and inclusive planning for local development.

• Deen Dayal Upadhyaya Panchayat Empowerment Award (DDUPSP)

• This award is given to panchayats for their outstanding work in improving governance and delivering services.

• It emphasizes capacity building and empowerment of panchayats.

• Child Friendly Gram Panchayat Award (CFGPA)

• This award is given to Gram Panchayats that have made significant contributions to child welfare and development.
• It focuses on creating an environment conducive to the overall development of children in the village.

Q87. Answer: (a) 8.05

Shortcut Trick
Identify the Median Class where the cumulative frequency reaches N/2 = 50.
Cumulative Frequencies (CF): 6, 36, 76 (Median Class), 92, 96, 100.
Median Class is 7-10 with Lower Limit (l) = 7, Width (h) = 3, and Frequency (f) = 40.
Apply formula: 7 + [(50 − 36) ÷ 40] × 3 = 7 + (14 ÷ 40) × 3 = 7 + 1.05 = 8.05.
Therefore The correct answer is 8.05 letters.
Alternate Method
Given: Total frequency N = 100. Frequency of classes provided.
Formula Used: Median = l + [((n/2) − cf) ÷ f] × h
Where l = Lower limit, n = Total frequency, cf = Cumulative frequency of the preceding class, f = Frequency of the median class, and h = Class size.
=> Total Surnames (N) = 100 => N/2 = 50
=> Cumulative Frequencies: 6 (1-4), 36 (4-7), 76 (7-10), 92 (10-13), 96 (13-16), 100 (16-19)
=> Median Class = 7-10 (since 50 lies between 36 and 76)
=> l = 7, cf = 36, f = 40, h = 3
=> Median = 7 + [(50 − 36) ÷ 40] × 3
=> Median = 7 + [14 ÷ 40] × 3
=> Median = 7 + 0.35 × 3
=> Median = 7 + 1.05 = 8.05
Therefore The correct answer is 8.05 letters.
Additional Information
Empirical Relationship
The relationship between the three measures of central tendency is: 3 × Median = Mode + 2 × Mean.
Mode of Grouped Data
Mode = l + [(f1 − f0) ÷ (2f1 − f0 − f2)] × h, where f1 is the frequency of the modal class.
Arithmetic Mean
Mean = Σf_ix_i ÷ Σf_i, where x_i is the class mark (mid-point) of each class interval.

Q88. Answer: (d) • @ ^ + # = $ >

Given:

Letter	A	S	V	J	I	L	N	E
Code	@		^	%	=	#	$	•

The code for the word 'JAVELINS' => %@^+#=$>
Terms:
2. If both the first and last letters of a word are consonants, then the first letter of the word will be coded as '*'.
Thus, the final code for the word 'JAVELINS' => * @ ^ + # = $ >
Hence, the correct answer is "* @ ^ + # = $ >".

Q89. Answer: (b) 324

The logic followed here is:
Logic: (1st number)² = 2nd number.
Now,
For, 14 : 196
=> $14^2 = 196$.
For, 16 : 256
=> $16^2 = 256$.
Similarly, for 18 : ?
=> $18^2 = 324$.

Hence, the correct answer is "Option 2".

Q90. Answer: (b) Condom use

The correct answer is Condom use.

Key Points

• Condoms are a mechanical barrier method of contraception.
• They are designed to prevent sperm from entering the uterus and thus prevent fertilization.
• Condoms are available for both males and females, though male condoms are more commonly used.
• This method is not only effective in preventing pregnancy but also in protecting against sexually transmitted infections (STIs).

Additional Information

• Male Sterilization
• Also known as a vasectomy, it is a permanent method of contraception for men.
• It involves cutting or sealing the vas deferens, which are the tubes that carry sperm from the testicles to the urethra.
• While effective, it is not considered a mechanical barrier method.
• Use of Copper-T
• It is an intrauterine device (IUD) that is inserted into the uterus to prevent pregnancy.
• The copper ions released by the device are toxic to sperm and egg, preventing fertilization.
• This method is a form of long-term contraception but not a mechanical barrier method.
• Use of Birth Control Pills
• These are hormonal contraceptives taken orally by women.
• They work by preventing ovulation, thickening cervical mucus, and thinning the uterine lining.
• While effective, they are not considered a mechanical barrier method.

Q91. Answer: (a) It solidifies as a hard solid mass.

The correct answer is It solidifies as a hard solid mass..

Key Points

• When calcium sulphate hemihydrate (commonly known as plaster of Paris) is mixed with water, it undergoes a chemical reaction.
• The chemical reaction results in the formation of calcium sulphate dihydrate (gypsum).
• This reaction causes the mixture to solidify and form a hard, solid mass.
• The process is exothermic, meaning it releases heat.

Additional Information

• Calcium Sulphate Hemihydrate (Plaster of Paris)
• Calcium sulphate hemihydrate is obtained by heating gypsum (calcium sulphate dihydrate) to about 150°C.
• It is widely used in construction, medical applications (such as casts), and artistic sculptures.
• The chemical formula for calcium sulphate hemihydrate is $CaSO_4 \cdot 0.5H_2O$.
• Gypsum (Calcium Sulphate Dihydrate)
• Gypsum is a naturally occurring mineral and is composed of calcium sulphate dihydrate ($CaSO_4 \cdot 2H_2O$).
• It is commonly used in the manufacture of drywall, plaster, and fertilizers.
• Gypsum has the ability to absorb and release moisture, making it useful in regulating humidity levels.
• Exothermic Reaction
• An exothermic reaction is a chemical reaction that releases energy in the form of heat.
• This type of reaction often results in an increase in temperature of the surrounding environment.
• In the case of mixing plaster of Paris with water, the heat released helps to speed up the setting process.
• Applications of Plaster of Paris
• Plaster of Paris is used in the medical field to create casts for broken bones because it hardens quickly and holds the bone in place.
• It is also used by artists for making sculptures and decorative objects.
• In construction, it is used for creating false ceilings, wall decorations, and other architectural elements.

Q92. Answer: (a) $3x^2 + 3y^2 - 20$

Shortcut Trick

Identify the standard identity: $(x + y)^2 + (x - y)^2 = 2(x^2 + y^2)$.

Substitute this into the expression: $(x^2 + y^2) + [2(x^2 + y^2)] - 20$.

Combine like terms: $(1 + 2)(x^2 + y^2) - 20 = 3(x^2 + y^2) - 20$.

Final simplified form: $3x^2 + 3y^2 - 20$.

Therefore The correct answer is $3x^2 + 3y^2 - 20$.

Alternate Method

Given: $x^2 + y^2 + (x - y)^2 + (x + y)^2 - 20$

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

$=> x^2 + y^2 + (x^2 - 2xy + y^2) + (x^2 + 2xy + y^2) - 20$

$=> x^2 + y^2 + x^2 - 2xy + y^2 + x^2 + 2xy + y^2 - 20$

$=> (x^2 + x^2 + x^2) + (y^2 + y^2 + y^2) + (-2xy + 2xy) - 20$

$=> 3x^2 + 3y^2 + 0 - 20$

$=> 3x^2 + 3y^2 - 20$

Therefore The correct answer is $3x^2 + 3y^2 - 20$.

Additional Information

Square of a Sum Identity

$(a + b)^2 = a^2 + 2ab + b^2$ is used to expand expressions involving the sum of two terms.

Square of a Difference Identity

$(a - b)^2 = a^2 - 2ab + b^2$ is used for expanding terms with subtraction.

Sum and Difference Combination

$(a + b)^2 + (a - b)^2 = 2(a^2 + b^2)$, while $(a + b)^2 - (a - b)^2 = 4ab$.

Difference of Two Squares

$a^2 - b^2 = (a - b)(a + b)$, which is useful for factorisation and simplification.

Q93. Answer: (c) It bends away from the normal.

The Correct answer is It bends away from the normal.

Key Points

• When a ray of light enters from a denser medium (e.g., water) to a rarer medium (e.g., air), it bends away from the normal due to the change in the speed of light.

• This phenomenon is governed by the principle of refraction.

• The bending of light occurs because light travels faster in a rarer medium and slower in a denser medium.

• The degree of bending depends on the refractive index of the two media. The refractive index measures how much light slows down in a medium compared to the vacuum.

• Refraction follows Snell's Law, which is expressed as: $n1 \sin \theta1 = n2 \sin \theta2$, where n1 and n2 are the refractive indices of the two media, and $\theta1$ and $\theta2$ are the angles of incidence and refraction respectively.

• In this case, the refractive index of the denser medium is higher, so the light ray bends away from the normal when it enters the rarer medium.

• This concept is widely applied in technologies like lenses, prisms, and optical instruments.

Additional Information

• Option 1: It is not refracted

• Light is always refracted when it passes between two media with different refractive indices, unless it hits the boundary at a normal incidence (i.e., at 90° to the surface). This option is incorrect because refraction is a natural phenomenon that occurs during such transitions.

• Option 2: It bends towards the normal

• Light bends towards the normal only when it passes from a rarer medium into a denser medium, such as from air to water. This option does not apply to the given scenario where light moves from a denser to a rarer medium.

• Option 4: Its angles of incidence and refraction are equal

• Angles of incidence and refraction are equal only when the refractive indices of both media are the same, or when light passes perpendicular to the surface. This option is incorrect as the media have different refractive indices.

Q94. Answer: (c) Main axis

The correct answer is Main axis.

Key Points

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

• The main axis, or principal axis, is an imaginary line that passes through the center of curvature and the vertex of the mirror.

• When a beam of light parallel to the principal axis strikes a concave mirror, it reflects and converges at the principal focus.

• The principal focus is the point where parallel rays of light either converge (concave mirror) or appear to diverge from (convex mirror) after reflecting from the mirror.

Additional Information

• Concave Mirror:

• A concave mirror has a reflective surface that is curved inward, resembling a portion of the interior of a sphere.

• It is used to focus light and form real, inverted images when the object is placed beyond the focal length.

• Concave mirrors are commonly used in telescopes, headlamps, and shaving mirrors.

• Principal Focus:

• The principal focus of a concave mirror is the point on the principal axis where light rays parallel to the principal axis converge after reflection.

• The distance between the mirror's surface and the principal focus is called the focal length.

• Reflection of Light:

• Reflection is the change in direction of a wavefront at an interface between two different media so that the wavefront returns into the original medium.

• Concave mirrors reflect light inward to one focal point, which is why they are used to focus light.

• Main Axis (Principal Axis):

• The principal axis is an imaginary line that passes through the center of curvature and the vertex of the mirror.

• It is important in understanding the path of light rays in concave and convex mirrors.

Q95. Answer: (c) 5

According to the given information:

Thus, 5 people play both Hockey and Cricket but do not play Badminton.

Hence, the correct answer is "5".

Q96. Answer: (b) Rajasthan

The correct answer is Rajasthan.

Key Points

• Hindi is the official language of Rajasthan, a state in northern India.

• Rajasthan, the largest state in India by area, has a rich cultural heritage where Hindi is predominantly spoken.

• Rajasthan adopted Hindi as its official language in accordance with the linguistic policies of India.

• Besides Hindi, Rajasthani and its various dialects are also widely spoken across the state.

Additional Information

• Official Language Policy in India

• India does not have a national language but has two official languages at the national level: Hindi and English.

• The Eighth Schedule of the Indian Constitution lists 22 languages recognized as scheduled languages.

• Each state in India can have its own official language(s) in addition to the central government's official languages.

• This diversity in languages reflects India's rich cultural and linguistic heritage.

• Rajasthan's Cultural Heritage

• Rajasthan is known for its vibrant culture, historical forts, palaces, art, and music.

• The state celebrates numerous festivals like Diwali, Holi, Teej, and Gangaur with traditional fervor.

• Rajasthani cuisine, traditional attire, and folk dances are integral to its cultural identity.

• The state's tourism industry thrives on its cultural and historical attractions.

• Languages of Rajasthan

• Rajasthani languages include Marwari, Mewari, Dhundhari, Harauti, and others.

• These languages are part of the Indo-Aryan language family.

• Despite the prevalence of Rajasthani dialects, Hindi serves as the official language for administrative purposes.

• The use of Hindi in education and government ensures uniformity and accessibility across the state.

Q97. Answer: (d) 13

Given: Some people are sitting in a row facing north.

1) Y is sitting fourth to the right of A.

2) Only four people are sitting between Y and Z.

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3) B is sitting second to the left of Z.

4) Only one person is sitting between Z and C.

5) X is sitting immediately next to the right of C.

6) X is sitting at one of the ends of the row.

Thus, the final arrangement:

If no other person is sitting in the row, then 13 is the total number of people sitting in the row.

Hence, the correct answer is "13".

Q98. Answer: (c) B

Given: Six persons, A, B, C, D, E and F are sitting in a straight line facing north.

1) Only one person sits to the left of D.

2) Only two persons sit between F and C.

3) B sits third to the right of E.

4) D sits immediate left of F.

5) E sits at the left end.

Thus, the final arrangement:

So, Both A and F sit immediate next to B.

Hence, the correct answer is "B".

Q99. Answer: (a) II does not support the statement while I supports the statement.

Given,

Statement:

Indian society is a symbol of unity in diversity.

Logic:

I. People of different cultural identities live with pride in the Indian society - Supports (Because, the statement highlights the coexistence of diverse cultural identities in India, living with pride, which reflects unity in diversity).

II. Brain drain is an indicator of unity in diversity in India - Does not support (Because, brain drain refers to the emigration of educated and skilled professionals, and it does not indicate unity in diversity).

So, Only logic I supports the statement.

Hence, the correct answer is "Option 1".

Q100. Answer: (a) 110°

Shortcut Trick

For parallel lines PQ || RS, the angle formed by two intersecting transversals (the M-shape) is equal to the sum of the interior alternate angles.

angle ABC = angle PAB + angle BCS

angle ABC = 40° + 70° = 110°

Therefore The correct answer is 110°.

Alternate Method

Given: PQ || RS, angle PAB = 40°, and angle BCS = 70°.

Formula Used: Alternate Interior Angles property of parallel lines.

P

Q

R

S

A

B

C

40°

70°

?

X

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