RRB Group D Previous Year Paper (Held on: 14 Sept 2022 Shift 3)

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

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CBT

Q1. Simplify: 34 - 66 ÷ 6 + 18 × 8.

(a) 104
(b) 138
(c) -600
(d) 167

Q2. Raghav's monthly salary is Rs. 18,000. Raghav took a loan of Rs. 30,000 on simple interest for 3 years at the rate of 5% per annum. The amount that he will be paying as simple interest in 3 years is what percentage of his monthly salary?

(a) 20%
(b) 30%
(c) 25%
(d) 35%

Q3. In electrical geyser _____ energy is converted to _____.

(a) Electrical, heat
(b) Mechanical, electrical
(c) Electrical, magnetic
(d) Electrical, light

Q4. If 19 November 2005 is a Saturday, then what will be the day of the week on 23 November 2008?

(a) Tuesday
(b) Wednesday
(c) Friday
(d) Sunday

Q5. The historic place 'Chauri Chaura' is situated in which state?

(a) Himachal Pradesh
(b) Uttar Pradesh
(c) Andhra Pradesh
(d) Kerala

Q6. Evaluate 999^3.

(a) 997005999
(b) 997002999
(c) 997003999
(d) 997004999

Q7. Each vowel in the word THUNDER is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order. Which of the following letters will appear in the middle of the group of letters thus formed?

(a) V
(b) O
(c) M
(d) N

Q8. Garhwal was the birthplace of the _____.

(a) Chipko Movement
(b) Narmada Bachao Andolan
(c) Jungle Bachao Andolan
(d) Bishnoi Movement

Q9. In which of the following states are the Palitana temples, a Jain pilgrimage site, located?

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

Q10. Factorise $49a^2 + 70ab + 25b^2$.

(a) $(7a - 5b)^2$
(b) $(7a + 5b)^2$
(c) $(5a - 7b)^2$
(d) $(5a + 7b)^2$

Q11. We can obtain an image that is real and of equal size when an object is placed _____ of a _____ mirror.

(a) between P and F, concave
(b) at F, concave
(c) at F, convex
(d) at C, concave

Q12. The LCM of 36, 48, 120 and 300 is:

(a) 1800
(b) 1200
(c) 3600
(d) 900

Q13. Which of the following is the most environment-friendly method of disposing of organic wastes?

(a) Incineration
(b) Landfills
(c) Development of value-added products
(d) Composting

Q14. On 7 March 2022, the Ministry of Women and Child Development (MoWCD), in partnership with the Ministry of Education and UNICEF, launched a landmark campaign to bring back out of school adolescent girls in India to the formal education and/or skilling system. What is the name of this campaign?

(a) Kanya Pravesh Utsav
(b) Kanya Shikhsan Utsav
(c) Kanya Pathshala Utsav
(d) Kanya Shikhsa Pravesh Utsav

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Q15. Which of the following industries does NOT use washing soda?

(a) Paper
(b) Soap
(c) Glass
(d) Cosmetic

Q16. As per the Ministry of Mines, as of 2021, 44% of the country's primary gold ore reserves is in _____.

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

Q17. What are the group numbers of halogens and carbon family, respectively, in the modern periodic table?

(a) Group 16 and Group 17
(b) Group 17 and Group 14
(c) Group 16 and Group 14
(d) Group 18 and Group 14

Q18. Which of the following statements correctly describes water transport in plants?

(a) The process which is the main driving force of water into the xylem during the day is root pressure.
(b) The process in which loss of water takes place in the form of water vapour through stomata is called transpiration.
(c) The process of water loss from stomata requires energy in the form of ATP.
(d) The process by which water is pulled from the xylem cells of the roots into leaves is called translocation.

Q19. Two trains are moving in opposite directions at speeds of 80 km/h and 120 km/h. The length of one train time is 300 m. The time taken by them to cross each other is 12 seconds. The length (in m) of the other train, correct to 2 decimal places, is:

(a) 388.88
(b) 333.33
(c) 377.77
(d) 366.67

Q20. All 24 students of a class are standing in a straight row facing north. Neha is 8^(th) from the right end, while Abhishek is 20^(th)from the left end. How many students are standing between Neha and Abhishek?

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

Q21. Which of the following terms will replace the question mark (?) in the given series to make it logically complete?
BKS36, GPX48, LUC60, QZH72, ?

(a) VEM88
(b) MVE84
(c) VEM84
(d) MVE88

Q22. What is good way to get relief from leg muscle cramps after intense activity?

(a) Gentle massage with warm pads
(b) Applying a pain reliever ointment
(c) Rubbing legs with an ice-pack
(d) Drinking warm sweet milk or tea

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Q23. A group of numbers/symbols is coded using letters as per the table given below and the conditions that follow. The correct combination of codes following the conditions is your answer.

Number/symbol	**6**	**%**	**8**	**9**	**@**	**$**	**5**	**4**	**^**	**•**	**#**	**3**	**7**	**9**
Code Letter	G	O	H	Q	T	M	A	B	L	M	F	S	Q	R

Conditions:

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

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

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

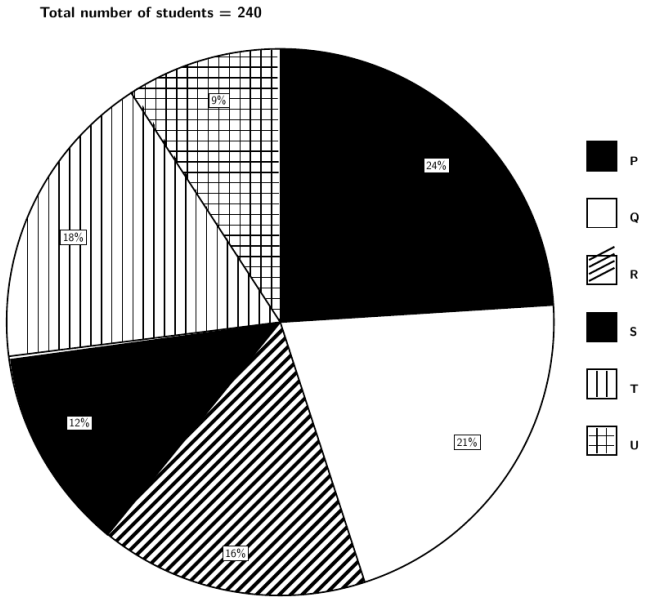
What will be the code for 3 @ 4 # 4?

(a) STBF ©
(b) ©TBF©
(c) ©TFBC
(d) SFTF©

Q24. If 2 is added to each odd digit and 2 is subtracted from each even digit in the number 5374816. What will be the product of the digits which are second from the left and second from the right in the new number thus formed?

(a) 20
(b) 15
(c) 3
(d) 28

Q25. The given pie chart shows the number of students in six different Houses- P, Q, R, S, T and U of VV International School. Study the chart and answer the question.



Find the ratio of students in House S to students in House T.

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

Q26. In preparation of NaOH by electrolytic method, which solution is used?

(a) lime water
(b) Brine
(c) Bromine water
(d) Chlorine water

Q27. What do you call an economic contraction (recession) followed by an expansion?

(a) Business Cycle
(b) Production function
(c) Adaptive Expectations
(d) Balance of payment

Q28. Read the given statement and arguments carefully and select the appropriate answer from the given options.

Statement:

Unemployment among youth has emerged as the biggest challenge in post-COVID-19 times.

Arguments:

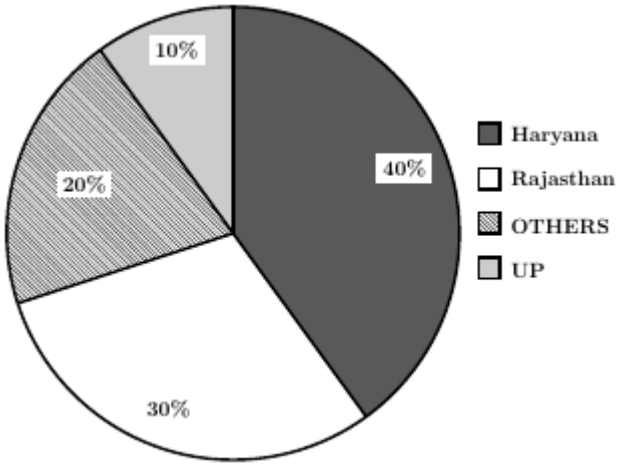
I. Many small-scale industries stopped working during the COVID period.

II. People do not want to work in small scale industries.

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

Q29. Study the given pie chart and answer the question that follows.

The pie-chart shows the number of tourists visiting from different states. The total tourist traffic is 20 lakh.



Find the difference between the number of tourists visiting from Haryana and Rajasthan.

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

Q30. Read the given statements and conclusions carefully and decide which of the given conclusions logically follows the statements.

Statements:

1. D ≥ S
2. X < W
3. S = J
4. W >Y
5. X > D

6. J ≥ E

Conclusions:

I. D < Y

II. D = E

III. E = S

IV. W > J

(a) Only conclusion IV follows
(b) Only conclusion I follows
(c) Only conclusion II follows
(d) Only conclusion III follows

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

72 : 90 :: 48 : 60 :: 24 : ?

(a) 32
(b) 24
(c) 30
(d) 40

Q32. A shopkeeper marked the price of an article at 10% higher than its cost price. He then gives two successive discount of 5% each. What is his loss or profit percentage?

(a) 0.525% loss
(b) 0.725% profit
(c) 0.525% profit
(d) 0.725% loss

Q33. In the given letter-cluster pairs, the first letter-cluster is related to the second letter-cluster following a certain logic. Study the given pairs carefully, and from the given options, select the pair that follows the same logic.

OKD : RNG

MKS : PNV

(a) RVH : UYK
(b) HKV : EKH
(c) RVH : VUK
(d) HVK : UKH

Q34. Observe the given series and find the product of the third number from the left side and fifth number from the right side.

23 35 76 87 45 28 49 98 56 34 37 48 78 75 64 89 73

(a) 4586
(b) 2880
(c) 5928
(d) 6525

Q35. The _____ Constitutional Amendment Act of 1992 was responsible for adding Part IX to the Constitution, 'The Panchayats'.

(a) 74^(th)
(b) 83^(rd)
(c) 7^(th)
(d) 73^(rd)

Q36. The ratio of the lengths of two corresponding sides of two similar triangles is 3 : 1. The ratio of their corresponding angles is:

(a) 3 : 1
(b) 1 : 1

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(c) 1 : 3
(d) 2 : 1

Q37. Which of the following carry/carries digested and absorbed fat from the intestine?
(a) Plasma
(b) Lymph
(c) Platelets
(d) Veins

Q38. An object is placed on the principal axis of a convex lens, at a point beyond 2F1. Its image formed is _____.
(a) real and enlarged
(b) virtual and diminished
(c) virtual and enlarged
(d) real and diminished

Q39. Three statements are given, followed by two conclusions numbered I and II. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

1. Some apricots are peaches.
2. Some kiwis are apricots.
3. All apricots are sweet-limes.

Conclusions:

I. Some sweet-limes are kiwis.

II. No peach is sweet-lime.

(a) Either conclusion I or II follow
(b) Only conclusion II follows
(c) Only conclusion I follows
(d) Both conclusions I and II follow

Q40. As of August 2022, what is the prescribed maximum age of the subscriber under Atal Pension Yojana (APY) when the minimum prescribed age is 18 years?
(a) 60 years
(b) 55 years
(c) 40 years
(d) 35 years

Q41. Which of the following features of the Constitution of India is borrowed from the Constitution of the United Kingdom?
(a) Concurrent list
(b) Directive principles of state policy
(c) Fundamental duties
(d) Single citizenship

Q42. Which of the following coloured precipitates is formed when lead (II) nitrate and potassium iodide are mixed together?
(a) Violet
(b) Green
(c) Yellow
(d) Black

Q43. If 2, 3, 8 and y are in proportion, find the value of y.
(a) 16
(b) 48
(c) 24

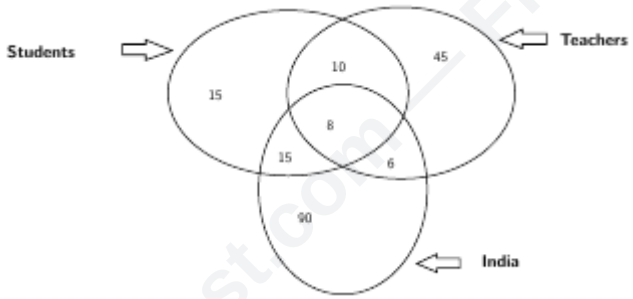
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(d) 12

Q44. If -(2/3) is a root of the equation $kx^2 - 13x - 10 = 0$, the the value of k is:

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

Q45. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



How many such students are there who are also teachers but NOT from India?

(a) 20
(b) 10
(c) 12
(d) 60

Q46. The average of 3^2, 4^2, 5^2, 6^2 and 7^2 is _____.

(a) 25
(b) 24
(c) 27
(d) 28

Q47. Where is the ozone hole located?

(a) Over the Equator
(b) Over the North and South Poles
(c) Over industrialised Europe
(d) Over Antarctica

Q48. If the digits 6 and 5 are replaced with 3 and 9, respectively, in the number 265367856, what will be the sum of the 1^(st) and the 5^(th) digits (when counted from the left) in the new number thus formed?

(a) 17
(b) 5
(c) 13
(d) 8

Q49. A boy covers 450 m in 2 minutes 30 seconds. How many kilometres will he cover in an hour if he travels at the same speed mentioned above?

(a) 13.5
(b) 12.8
(c) 10.8
(d) 9.6

Q50. Jyoti starts from the mall and drives 4 km towards West. She then takes a left turn, drives 8 km, turns left and drives 24 km. She then takes a left turn and drives 6 km. She then turns left, drives 6 km and reaches her home. Which direction is the mall with reference to her home?

(a) North - West
(b) South - east

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(c) North
(d) South - West

Q51. 40 students of a class are standing in a queue according to the increasing order of their heights. Suhani is 8^(th) from the front, while Syma is 8^(th) from the back. How many students are standing between Suhani and Syma?
(a) 21
(b) 24
(c) 23
(d) 25

Q52. Which of the following numbers will replace the question mark (?) in the given series?
87, 76, 67, 60, 55, ?
(a) 50
(b) 53
(c) 51
(d) 52

Q53. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.
8 : 32 :: 18 : 162 :: 16 : ?
(a) 118
(b) 128
(c) 130
(d) 120

Q54. Electromagnetic induction is the phenomenon wherein:
(a) a moving closed loop of a conductor induces an EMF in the closed loop of another conductor
(b) a moving magnet exerts force on the closed loop of a conductor
(c) a moving magnet induces an EMF in the closed loop of a conductor
(d) a moving coil carrying current induces force on the magnet

Q55. The marks scored by 10 students are given below.
17, 13, 18, 11, 15, 13, 19, 18, 13, 17
The mode of the data is:
(a) 11
(b) 17
(c) 13
(d) 19

Q56. Which of the following industries has developed the most on the banks of the Hooghly river?
(a) Sugar Industry
(b) Dairy Industry
(c) Iron-ore Industry
(d) Jute Industry

Q57. The volume (in m^3) of a cube, each of whose edges is 9 m, is:
(a) 648
(b) 527
(c) 486
(d) 729

Q58. The Norman Borlaug National Excellence Award is given for excellence in which research field?
(a) Agricultural Sciences
(b) Physical Sciences
(c) Chemical Sciences

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(d) Energy Sciences

Q59. Parenchyma tissue is the most common simple permanent tissue in plants. Why is it known as Chlorenchyma and Aerenchyma in some plants?

(a) Chlorenchyma - Has air spaces (aquatic plants) and helps them to float
Aerenchyma - has chlorophyll for photosynthesis

(b) Chlorenchyma - Has air spaces (aquatic plants) and helps them to float
Aerenchyma - provides mechanical support

(c) Chlorenchyma - supports the plant
Aerenchyma - Has chlorophyll for photosynthesis (leaves)

(d) Chlorenchyma - Has chlorophyll photosynthesis (leaves)
Aerenchyma - Has air spaces (aquatic plants) and helps them to float

Q60. Amit starts from Point Y and drives 8 km towards the north. He then takes a right turn, drives 12 km, turns right and drives 11 km. He then takes a right turn and drives 15 km. He takes a final right turn, drives 3 km and stops at Point Z. How far and towards which direction should he drive in order to reach Point Y from Point Z? (All turns are 90 degree turns only)

(a) 3 km towards the east
(b) 3 km towards the north
(c) 2 km towards the west
(d) 2 km towards the east

Q61. The roots of the equation $\sqrt{3}x^2 - 8x + 5\sqrt{3} = 0$ are:

(a) $-\sqrt{3}, (-5)/(\sqrt{3})$
(b) $\sqrt{3}, (-5)/(\sqrt{3})$
(c) $\sqrt{3}, 5/(\sqrt{3})$
(d) $-\sqrt{3}, 5/(\sqrt{3})$

Q62. Which of the following is an INCORRECT relation between V, I and R?

(a) V = R/I
(b) R = V/I
(c) V = IR
(d) I = V/R

Q63. The 'Lohit' is a tributary of which river from following?

(a) Cauvery
(b) Indus
(c) Narmada
(d) Brahmaputra

Q64. Neeraj and his sister are 12 years and 3 years old, respectively. After how many years will Neeraj's sister be half as old as Neeraj?

(a) 7
(b) 9
(c) 3
(d) 6

Q65. On increasing the potential difference applied across a conductor at constant temperature, _____

(a) current increases
(b) current decreases
(c) current remains constant
(d) current becomes zero

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Q66. Which of the following is the correct period for which the Annual Budget 2021-22 of the Indian Government was announced?

(a) 1 July - 30 June 2021-22
(b) 1 November - 31 October 2021-22
(c) 1 April - 31 March 2021-22
(d) 31 March - 1 April 2021-22

Q67. The largest peninsular river in India is:

(a) Krishna
(b) Narmada
(c) Godavari
(d) Cauvery

Q68. Amongst six cousins, P, Q, R, S, T and U, each are of a different age. P's age is more than that of only one cousin. Q's age is more than that of S and P but not more than that of R. S's age is immediately more than P's age. R is younger than U. T is the youngest. Who is the oldest among all the cousins?

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

Q69. In an isosceles triangle, the vertex angle measures 80°. What is the measure of each of the base angles?

(a) 60° and 60°
(b) 50° and 50°
(c) 60° and 40°
(d) 60° and 50°

Q70. From which of the following countries India has purchased S-400 Missile System?

(a) Israel
(b) Canada
(c) America
(d) Russia

Q71. Shri Lal Bahadur Shastri National Sanskrit University is located in _____.

(a) Lucknow
(b) Jaipur
(c) New Delhi
(d) Pune

Q72. In which of following states of India is the cultural festival 'LOSAR' celebrated?

(a) Arunachal Pradesh
(b) Karnataka
(c) Goa
(d) Nagaland

Q73. The value of (sin32° cos58° + cos32° sin 58°) is:

(a) 3
(b) 2
(c) 1
(d) 0

Q74. An electric generator is a device which converts:

(a) mechanical energy into electrical energy
(b) mechanical energy into light energy
(c) electrical energy into mechanical energy

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(d) light energy into mechanical energy

Q75. A dishonest shopkeeper sells goods at cost price but uses a weight of 940 gm for one kg. His gain percentage (rounded off to two decimal places) is:

(a) 4.38%
(b) 6.08%
(c) 6.38%
(d) 5.38%

Q76. A cylindrical rod has an outer curved surface area of 2800 cm^2. If the length of the rod is 100 cm, then the outer radius (in cm) of the rod, correct to two places of decimal, is:

Take $\pi = 22/7$

(a) 4.45
(b) 5.45
(c) 2.45
(d) 3.45

Q77. The Banking Regulation Act, 1949 is a law that regulates banking firms in India. This Act was amendment by the Banking Regulation (Amendment) Act of which year?

(a) 2016
(b) 2018
(c) 2020
(d) 2014

Q78. Who among the following Indian cueists won his eighth title at the 19^(th) Asian 100 UP Billiards Championship 2022?

(a) Wilson Jones
(b) Pankaj Advani
(c) Alok Kumar
(d) Dhruv Sitwala

Q79. J, L, N, P, R, T, V and W are sitting around a square table facing the centre of the table (but not necessarily in the same order). Some of them are sitting at the corners while some are sitting at the exact centre of the sides. W is on the immediate left of J but not an immediate neighbour of P or R. T is on the immediate right of L. N has R and T as his immediate neighbours, V is immediate neighbour of R. Who is sitting to the immediate left of P?

(a) J
(b) V
(c) R
(d) L

Q80. Select the number from among the given options that can replace the question mark (?) in the following series.

3, 4, 4, 6, 12, 15, ?, 49, 196, 201

(a) 45
(b) 37
(c) 27
(d) 32

Q81. Which of the following reactions is NOT a combination reaction?

(a) C + O2 → CO2
(b) HI → H2 + I2
(c) H2 + O2 → H2O
(d) NH3 + HCI → NH4CI

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Q82. Which of the following compounds does NOT belong to the same homologous series?

(a) C4H8
(b) C3H6
(c) C6H11
(d) C5H10

Q83. A rainbow is observed due to refraction of the sunlight through rain drops. This implies that:

(a) sunlight is polychromatic
(b) refractive index of rain drop is 1
(c) rain drops are not spherical in shape
(d) sunlight is monochromatic

Q84. A certain number of persons are standing in a straight row facing North. X is standing to the immediate left of W but immediate right of R. Z is standing to the immediate left of R. There is only one person to the left of P. Q is standing to the immediate left of Y. The person standing at the extreme right end is the only person to the right of Y. Only four persons are standing between P and Q. If no other person is standing in the row, what is the total number of persons standing?

(a) Seven
(b) Ten
(c) Eight
(d) Nine

Q85. Three statements are given, followed by four conclusions numbered I, II, III and IV. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

1. All pictures are drawings.
2. No drawing is caricature.
3. All figures are caricatures.

Conclusions:

I. Some figures are pictures.
II. No caricature is picture.
III. No picture is figure.
IV. Some caricatures are pictures.

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

Q86. A, B and C invested Rs. 10,000, Rs. 12,000, and Rs. 15,000, respectively, for 5, 6, and 9 months, respectively, in a business. If A's share in the profit is Rs. 2,500, then the total profit is:

(a) Rs. 12,700
(b) Rs. 12,650
(c) Rs. 12,850
(d) Rs. 12,550

Q87. Three numbers are in the ratio 5 : 6 : 8 and their LCM is 1200. The sum of the number is:

(a) 190
(b) 180
(c) 210
(d) 200

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Q88. The average age of a husband and his wife was 23 years at the beginning of their marriage. After 5 years of marriage, they had a one-year-old child. The average age of the family of three when the child was born was:

(a) 20 years
(b) 18 years
(c) 24 years
(d) 23 years

Q89. A group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number/symbol	**4**	**%**	**5**	**8**	**@**	**$**	**5**	**4**	**^**	**•**	**#**	**3**	**7**	**9**
Code Letter	G	O	H	P	T	M	A	B	L	N	F	S	Q	R

Conditions:

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

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

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

What will be the code for 5 @ $ ^ 8?

(a) HTMLP
(b) ©TMLP
(c) HTML©
(d) ©TML©

Q90. In humans, the sex of the offspring is determined by the _____.

(a) paternal chromosome
(b) both maternal and paternal chromosomes
(c) maternal chromosome
(d) autosomes

Q91. Six friends M, N, O, P, Q and R are seated around a round table facing the centre. P is an immediate neighbour of both N and R. Q is an immediate neighbour of both M and O. N is not seated at either side of O. Where is M seated?

(a) Beside P
(b) Beside R
(c) Beside O
(d) Beside N

Q92. The Finance Commission is a constitutionally mandated body, set up under Article _____ of the Constitution of India.

(a) 276
(b) 280
(c) 273
(d) 288

Q93. The value of (0.064) + (0.008)/(0.16 + 0.04 - 0.08) is _____.

(a) 2.7
(b) 0.6
(c) 1.4
(d) 0.05

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Q94. Study the given number series and answer the question that follows.

(Left) 9 6 7 6 8 2 5 7 3 2 5 8 6 2 7 5 4 9 2 4 7 3 8 5 (Right)

How many such even numbers are there each of which is immediately preceded by an odd number and also immediately followed by an odd number?

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

Q95. Which of the following statements is correct with respect to Newlands law of octaves?

(a) Newlands' law of octaves worked well with heavier elements only.
(b) John Newlands, an English scientist arranged the then known elements in the order of increasing atomic sizes.
(c) Newlands' law of octaves worked well with lighter elements only.
(d) In Newlands' octaves, the properties of fluorine and sodium were found to be the same.

Q96. Evaluate 0.696696... × 0.2727....

(a) 2083/10989
(b) 2085/10989
(c) 2087/10989
(d) 2088/10989

Q97. Where was the final match of Indian Premier League (IPL) 2022 played?

(a) Wankhede Stadium, Mumbai
(b) M Chinnaswamy Stadium, Bengaluru
(c) Narendra Modi Stadium, Ahmedabad
(d) Green Park Stadium, Kanpur

Q98. In a balanced chemical equation, the reactant is always written _____ the arrow.

(a) above
(b) on the right-hand side of
(c) on the left-hand side of
(d) below

Q99. Which of the following options is the closest approximate value which will come in place of question mark(?) in the following equation?

5.18 × 4 + 2.06 × 5 - 10 ÷ 2 + 1 = ?

(a) 15
(b) 40
(c) 26
(d) 30

Q100. An object must be placed _____ to obtain a real and inverted image of the same size as that of the object after reflection.

(a) at infinity from a concave mirror
(b) at C of a concave mirror
(c) between P and F of a convex mirror
(d) at C of a convex mirror

ANSWER KEY

1	d	2	c	3	a	4	d	5	b	6	b	7	c	8	a	9	c	10	b
11	d	12	c	13	d	14	d	15	d	16	a	17	b	18	b	19	d	20	a
21	c	22	a	23	b	24	b	25	d	26	b	27	a	28	b	29	c	30	a

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31	c	32	d	33	a	34	c	35	d	36	b	37	b	38	d	39	c	40	c
41	d	42	c	43	d	44	d	45	b	46	c	47	d	48	b	49	c	50	a
51	b	52	d	53	b	54	c	55	c	56	d	57	d	58	a	59	d	60	a
61	c	62	a	63	d	64	d	65	a	66	c	67	c	68	a	69	b	70	d
71	c	72	a	73	c	74	a	75	c	76	a	77	c	78	b	79	a	80	a
81	b	82	c	83	a	84	d	85	a	86	c	87	a	88	b	89	d	90	a
91	d	92	b	93	b	94	a	95	c	96	d	97	c	98	c	99	c	100	b

SOLUTIONS

Q1. Answer: (d) 167

Given: 34 - 66 ÷ 6 + 18 × 8

The concept used: BODMAS rule

Calculations:

Now, according to the question,

34 - 66 ÷ 6 + 18 × 8

=> 34 - 11 + 144

=> 167

Therefore, the correct answer is option 4.

Q2. Answer: (c) 25%

Shortcut Trick

Total Simple Interest rate for 3 years = 5% × 3 = 15%

Total Interest amount = 15% of Rs. 30,000 = Rs. 4,500

Required Percentage of Monthly Salary = (4,500 ÷ 18,000) × 100

=> 1/4 × 100 = 25%

Therefore The correct answer is 25%.

Alternate Method

Given:

Monthly Salary of Raghav = Rs. 18,000

Principal (P) = Rs. 30,000

Rate (R) = 5% per annum

Time (T) = 3 years

Formula Used:

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

Calculations:

=> Total Simple Interest = (30,000 × 5 × 3) ÷ 100

=> Total Simple Interest = 300 × 15 = Rs. 4,500

=> Required Percentage = (Total SI ÷ Monthly Salary) × 100

=> Required Percentage = (4,500 ÷ 18,000) × 100

=> Required Percentage = (1 ÷ 4) × 100

=> Required Percentage = 25%

Therefore The correct answer is 25%.

Additional Information

Total Amount in SI

The total amount (A) to be paid back after the time period is the sum of the Principal and the Simple Interest: A = P + SI.

Effect of Rate and Time

Simple interest is directly proportional to both the rate of interest and the time period. If the rate doubles, the interest doubles (keeping other factors constant).

Effective Rate of Interest

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In Simple Interest, the effective rate for the entire duration can be calculated as R_(eff) = R × T. This allows for direct calculation of total interest as a percentage of the principal.

Q3. Answer: (a) Electrical, heat

The correct answer is Electrical, heat.

Key Points

• The geyser operates on the simple principle of converting electrical energy into heat by using heating components to increase water temperature by conduction of the heat to the water.

• The geyser contains a heating element, usually made of a metal such as copper, which is immersed in the water tank.

• When the geyser is switched on, an electric current flows through the heating element, causing it to become very hot.

• The heating element transfers this heat to the water surrounding it, and over time, the water temperature rises until it reaches the desired temperature.

• The heating element in the geyser is made of a material with high electrical resistance, meaning that it resists the flow of electricity through it. As a result, when current flows through the heating element, it encounters resistance, which causes the element to heat up.

• The amount of heat generated by the heating element depends on its resistance, the amount of current flowing through it, and the time for which the current flows.

• The heating element in the geyser is designed to provide the appropriate amount of heat to raise the water temperature to the desired level in a reasonable amount of time.

• Hence, electrical geyser converts electrical energy into heat.

Q4. Answer: (d) Sunday

19 November 2005 is a Saturday.

Consider a regular year of days 365 as we know there are 52 weeks in a year. On consideration, each week has 7 days so there will total (52*7) = 364 days. That means if we started counting from Monday as 1st day then the 364th day will be Monday. The remaining day of the year will add up to the next day of the week from where we started, i.e., it will be Tuesday. That remaining day is called an odd day.

A normal year has 1 odd day, whereas a leap year has 2 odd days.

So, 2006 = 1 odd day

2007 = 1 odd day

2008 = 2 odd day (Leap year)

Total number of odd days = 1 + 1 + 2 = 4

Saturday + 4 days = Wednesday.

19 November 2008 will be ‘Wednesday’.

Now in question we have asked about 23 November 2008

23 -19 = 4 (days)

Wednesday + 4 = Sunday

Hence, the correct answer is “Sunday”.

Q5. Answer: (b) Uttar Pradesh

The correct answer is Uttar Pradesh.

Key Points

• The place named Chauri Chaura was notably related to Non-Cooperation Movement.

• The Chauri Chaura incident took place on 4 February 1922 in Chauri Chaura in the Gorakhpur district of the United Provinces (modern-day Uttar Pradesh) in British India, when a large group of protesters participating in the non-cooperation movement were fired upon by the police. In retaliation, the demonstrators attacked and set fire to a police station, killing all of its occupants.

• The incident led to the death of three civilians and 22 policemen.

• Due to this incident, Mahatma Gandhi called off the Non-Cooperation Movement.

• The Non-Cooperation movement was launched on 4 September 1920.

• Thousands of students boycotted Government schools and colleges.

• Gandhiji chalked out the following program for the Non-cooperation movement:-

• Surrender of titles

• Refusal to attend government functions

• Boycott of law courts

• Boycott of foreign goods

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• Not to vote in elections, etc.

Q6. Answer: (b) 997002999

Shortcut Trick

Use the algebraic identity $(a - b)^3 = a^3 - b^3 - 3ab(a - b)$.

Take a = 1000 and b = 1.

$999^3 = (1000 - 1)^3 = 1000^3 - 1^3 - 3 \times 1000 \times 1 \times (1000 - 1)$

= 1,000,000,000 − 1 − 2,997,000 = 997,002,999.

Therefore The correct answer is 997002999.

Alternate Method

Given: Number = 999

Formula Used: $(a - b)^3 = a^3 - 3a^2b + 3ab^2 - b^3$

=> Let a = 1000 and b = 1

=> $999^3 = (1000 - 1)^3$

=> $999^3 = (1000)^3 - 3(1000)^2(1) + 3(1000)(1)^2 - (1)^3$

=> $999^3 = 1000000000 - 3000000 + 3000 - 1$

=> $999^3 = 997000000 + 2999$

=> $999^3 = 997002999$

Therefore The correct answer is 997002999.

Additional Information

Cube of Sum Identity

The identity for addition is $(a + b)^3 = a^3 + b^3 + 3ab(a + b)$, useful for numbers slightly above base 100 or 1000.

Digit Sum Check

The digit sum of 999 is 9. Any power of a number with digit sum 9 will also have a digit sum of 9 (unless the power is 0).

Last Digit Rule

Since the number ends in 9, its cube must also end in 9 (9 × 9 × 9 = 729).

Q7. Answer: (c) M

The word is "THUNDER"

• Vowel = positional value + 1

• Consonant = positional value - 1

The letters after arrangement → SGVMCFQ

Here, M is the middle alphabet.

Hence, the correct answer is "M".

Q8. Answer: (a) Chipko Movement

The correct answer is -Chipko Movement.

Key Points

• Garhwal was the birthplace of the Chipko Movement.

• Chipko movement, also called Chipko Andolan, nonviolent social and ecological movement by rural villagers, particularly women, in India in the 1970s, aimed at protecting trees and forests slated for government-backed logging.

Additional Information

• The Jungle Bachao Andolan(1980) took shape when the government proposed to replace the natural Sal forest of Singhbhum District, Bihar (now Jharkhand), with a commercial teak plantation.

• Narmada Bachao Andolan is an Indian social movement spearheaded by native tribals, farmers, environmentalists, and human rights activists against a number of large dam projects across the Narmada River, which flows through the states of Gujarat, Madhya Pradesh, and Maharashtra.

• Bishnoi Movement was started around 260 years back in the early part of the 18th century in Rajasthan by the Bishnoi community.

Q9. Answer: (c) Gujarat

The correct answer is 'Gujarat'.

Key Points

• Palitana is an important city of pilgrimage holding the significance of salvation for the Jain community.

• It is situated 50 km South-west of Bhavnagar city in the state of Gujarat.

• Palitana is a city with as many as 823 temples of different sizes, dedicated to the 24 Tirthankaras or holy saints of the Jain community.

• The temples are delicately sculpted in marble. The main temple of the first Tirthankara, Shree Adishwar has an elaborated architectural pattern.

• Since ancient times, it has been said that the number of people who achieved liberation is equal to the number of stones on the Shatrunjaya hills.

• Therefore, for the Jains, the temples on the Shatrunjaya hills are considered the most sacred place of pilgrimage.

• Jains believe that Adinath sanctified the mountain of Shatrunjaya by selecting it as the site of his first sermon.

• The conglomeration of temples was set up in two different time phases-some around the 11th-12th centuries and some around the 16th century.

Additional Information

• Temples present in other states:

STATES	TEMPLES
Rajasthan	Tijara Jain temple
Karnataka	Udupi Srikrishna Temple
Jharkhand	Baidyanath Temple

Q10. Answer: (b) $(7a + 5b)^2$

Shortcut Trick

Identify the expression as a perfect square trinomial of the form $x^2 + 2xy + y^2 = (x + y)^2$.

Take square roots of the first and last terms: $\sqrt{49a^2} = 7a$ and $\sqrt{25b^2} = 5b$.

Check the middle term: $2 \times 7a \times 5b = 70ab$, which matches the given expression.

The factored form is $(7a + 5b)^2$.

Therefore The correct answer is $(7a + 5b)^2$.

Alternate Method

Given Expression: $49a^2 + 70ab + 25b^2$

Formula Used: $(x + y)^2 = x^2 + 2xy + y^2$

$\Rightarrow 49a^2 = (7a)^2$

$\Rightarrow 25b^2 = (5b)^2$

$\Rightarrow 70ab = 2 \times (7a) \times (5b)$

$\Rightarrow 49a^2 + 70ab + 25b^2 = (7a)^2 + 2(7a)(5b) + (5b)^2$

$\Rightarrow (7a + 5b)^2$

Therefore, the expression is the square of the sum of 7a and 5b.

Therefore The correct answer is $(7a + 5b)^2$.

Additional Information

Perfect Square Trinomial (Minus)

The expression $a^2 - 2ab + b^2$ is factored as $(a - b)^2$.

Difference of Squares

The expression $a^2 - b^2$ is factored as $(a + b)(a - b)$.

Sum of Cubes

The expression $a^3 + b^3$ is factored as $(a + b)(a^2 - ab + b^2)$.

Q11. Answer: (d) at C, concave

The correct answer is at C, concave.

Key Points

• When we place object at C of concave mirror, we get a real and inverted image of same size.

Additional-information:

• When we place object between P and F of concave mirror

•

• We get an image which is virtual, erect and larger than the object.

• When object is placed focus of concave mirror.
• • image formed will be highly enlarged, erect and at infinity.
• When object is at focus of convex mirror:
• We cannot place any object at focus of convex mirror as it will be inside the mirror.

Q12. Answer: (c) 3600

Shortcut Trick
Identify the largest number 300 and check its multiples.
300, 600, 900, 1200, 1800, 3600...
Check divisibility: 3600 is divisible by 36 (100), 48 (75), 120 (30), and 300 (12).
All numbers divide 3600 exactly, making it the Least Common Multiple.
Therefore The correct answer is 3600.
Alternate Method
Given: Numbers are 36, 48, 120, and 300.
Method: Prime Factorization method.
=> 36 = $2^2 \times 3^2$
=> 48 = 2^4 × 3^1
=> 120 = $2^3 \times 3^1 \times 5^1$
=> 300 = $2^2 \times 3^1 \times 5^2$
=> LCM = Highest power of all prime factors involved
=> LCM = 2^4 × $3^2 \times 5^2$
=> LCM = 16 × 9 × 25
=> LCM = 144 × 25 = 3600
Therefore The correct answer is 3600.
Additional Information
Definition of LCM
The Least Common Multiple (LCM) is the smallest positive integer that is perfectly divisible by each of the given numbers.
LCM and HCF Relationship
For two numbers a and b: a × b = HCF(a, b) × LCM(a, b).
LCM of Fractions
LCM of Fractions = (LCM of Numerators) ÷ (HCF of Denominators).

Q13. Answer: (d) Composting

The correct answer is "Composting".
Key Points
• The biological process allows the organic component of the waste to decompose in strictly regulated circumstances.
• The material is transformed into richly nutritious manure or compost after composting.
• In agricultural settings, it serves as a soil conditioner and adds nutrients.
• Therefore, the correct answer is "Composting".
Additional Information Other techniques for disposing of municipal solid waste
• Incineration:
1. It involves burning trash in huge furnaces.
2. The recyclable materials are separated in these facilities, and the remaining materials are burned.
3. When the procedure is through, nothing but ash is left.
• Landfill: The most popular, cheap, and environmentally responsible way to get rid of solid garbage. It is utilized in cities where a lot of trash is produced. It is a pit that is excavated in the earth and covered after disposing of the trash to stop rats and flies from reproducing.
• Pulverization:
• This approach involves using grinding machines to turn collected solid waste into powder adjusting its size and physical attributes Landfilling is used to dispose of this crushed solid waste in the future.
• Recycling:
• It describes the process of removing waste-related objects so they can be used as raw materials in the production of new goods.

Q14. Answer: (d) Kanya Shikhsa Pravesh Utsav

The correct answer is Kanya Shikhsa Pravesh Utsav.

Key Points

• On March 7, 2022, the Kanya Shiksha Pravesh Utsav campaign was started by the Ministry of Women and Child Development in collaboration with the Ministry of Education and UNICEF.

• It was started to reintegrate out-of-school teenage girls into the formal education and/or skill-building systems in India.

• The Beti Bachao Beti Padhao program would provide funding for almost 400 districts for the creation of consciousness.

Additional Information

• Important Women's Empowerment Programs Announced by the Central Government Include:

1. Women's Empowerment Programs
2. The Beti Bachao Beti Padhao Plan
3. One-Stop Center Program
4. The Women Helpline Program
5. A Comprehensive Plan for the Rescue, Rehabilitation, and Reintegration of Trafficking and Commercial Sexual Exploitation Victims

Q15. Answer: (d) Cosmetic

The correct answer is Cosmetic.

Key Points

• Washing soda, also known as sodium carbonate (Na2CO3), is used to reduce water hardness, but is not used directly to disinfect water.

• Sodium carbonate, sometimes known as washing soda, is a chemical compound having the formula Na2CO3.

• It is a carbonic acid salt.

• It irritates the respiratory tract and can lead to coughing, wheezing, shortness of breath, searing sensation in the nose and throat, and other respiratory symptoms.

• When skin comes into touch with sodium carbonate, it can irritate, blister, and burn, especially if the skin is wet.

• When it comes into contact with the eyes, it can cause destruction of cornea as well as conjunctival edema, or swelling.

• These are the reasons why washing soda is not used in cosmetic industries.

Additional Information

• Features of a washing soda:

1. It is a crystalline solid that is translucent.
2. With a pH of 11, it is alkaline and changes red litmus to blue.
3. It may eliminate filth, hence it has detergent or cleansing characteristics and oil from soiled clothing, etc.
4. It breaks down oil and debris into water-soluble byproducts, which are subsequently removed with a water rinse.
5. It is utilized in the paper, soap, and glass industries.

Q16. Answer: (a) Bihar

The correct answer is "Bihar".

Key Points

• The state of Bihar contains 222.885 million tonnes of gold metal or 44% of the nation's total gold reserves.

• He claimed that after examining the GSI's findings, which showed the presence of gold in places like Karmatia, Jhajha, and Sono in the Jamui district, the consultation process got underway.

• The National Mineral Inventory estimates that the country's total primary gold ore resources as of January 1, 2015, was 501.83 million tonnes, with 654.74 tonnes of a gold metal, of which 222.885 million tonnes are found in Bihar.

Additional Information

• Experts believe that around 11.48 crore tonnes of gold resources have been discovered in Rajasthan, with the majority of these deposits being in the cities of Banswara and Udaipur.

• According to reports, the state of Karnataka in India produces the most gold. The state's reserves of recoverable gold ore total 17.5 million tonnes.

• Near Jamshedpur, GSI Finds About 250 Kilograms Of Gold Reserves.

Q17. Answer: (b) Group 17 and Group 14

The correct answer is Group 17 and Group 14.

Key Points

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• Halogens are a group of six elements of Group 17 in the periodic table.
• Fluorine (F)
• Chlorine (Cl)
• Bromine (Br)
• Iodine (I)
• Astatine (At)
• Tennessine (Ts)
• Halogens are nonmetals.
• Halogens are very reactive, the reactivity decreases from Fluorine to Astatine.
• Physical Properties of Halogens:
• They have a strong and often nasty smell.
• They are extremely toxic.
• They are poor conductors of heat and electricity.
• They have low melting and boiling points.
• Chemical Properties of Halogens:
• Their Molecules are diatomic.
• They have seven valence electrons as their one electron missing, they form negative ions and are highly reactive.
• They can gain an electron by reacting with atoms of other elements.
• Group 14, also known as the Carbon Group, is a significant part of the p-block in the periodic table. Here are some key points about Group 14:
• Members: This group includes carbon (C), silicon (Si), germanium (Ge), tin (Sn), lead (Pb), and flerovium (Fl).
• Electron Configuration: Each of these elements has only two electrons in its outermost p orbital with the electron configuration of ns2np2.
• Chemical Behavior: Group 14 elements show a wide range of chemical behaviors, more so than any other family in the periodic table. Three of the five elements—carbon, tin, and lead—have been known since ancient times.
• Oxidation States: The elements of this group typically show an oxidation state of +4, but lower oxidation states are also common, especially for the heavier elements.
• Anomalous Behavior of Carbon: Carbon, compared to the other elements in the group, displays distinctly different properties due to its smaller size, higher electronegativity, and absence of d orbitals in its valence shell.

Additional Information

• Group 15 of the periodic table is known as Pnictogens (Nitrogen group). The elements are as follows:
• Nitrogen (N)
• Phosphorous (P)
• Arsenic (As)
• Antimony (Sb)
• Bismuth (Bi)
• Group 16 of the periodic table is known as Chalcogens (Oxygen group). The elements are as follows:
• Oxygen (O)
• Sulphur (S)
• Selenium (Se)
• Tellurium (Te)
• Polonium (Po)
• Group 18 of the periodic table is known as Noble gases. The elements are as follows:
• Helium (He)
• Neon (Ne)
• Argon (Ar)
• Krypton (Kr)
• Xenon (Xe)
• Radon (Rn)

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Q18. Answer: (b) The process in which loss of water takes place in the form of water vapour through stomata is called transp...

The correct answer is The process in which loss of water takes place in the form of water vapor through stomata is called transpiration.

Key Points

• The term "transpiration" refers to the process of removing surplus water from the plant's body. Water molecules in the plant tissues are removed from the aerial regions of the plants during transpiration.

• Plants only use a small portion of the water they absorb for growth and development. The remainder is expelled through transpiration.90 % of excess water is transpired by stomata present in the leaves of the plants.

• A very little amount of water is transpired from the stems or barks of the plants with the help of lenticels.

Additional Information

• Transpiration helps in cooling the structures of the plant when exposed to hot sunlight. Excess water is removed from the cells of the plant to prevent plant decay.

• The osmotic balance of the cell is maintained by the process of transpiration.

• Transpiration is the unavoidable consequence of gas exchange in the leaf. This is because the plant has to open pores on the leaves called the stomata.

• When they open gas exchange occurs and the plant releases Oxygen as waste while simultaneously absorbing CO_2 for use during photosynthesis.

• It also helps in the absorption and distribution of water along with minerals from the soil through roots.

Q19. Answer: (d) 366.67

Shortcut Trick

Relative speed of trains = 80 + 120 = 200 km/h = 200 × (5/18) = 500/9 m/s.

Total distance covered in 12 seconds = Speed × Time = (500/9) × 12 = 2000/3 m = 666.67 m.

Length of the other train = Total Distance − Length of first train.

Length of the other train = 666.67 − 300 = 366.67 m.

Therefore The correct answer is 366.67 m.

Alternate Method

Given:

Speed of first train (S1) = 80 km/h

Speed of second train (S2) = 120 km/h

Length of first train (L1) = 300 m

Time taken to cross each other (T) = 12 seconds

Formula Used:

Relative Speed (when moving in opposite directions) = S1 + S2

Total Distance = Relative Speed × Time

L1 = 300 m

80 km/h →

L2 = x m

← 120 km/h

Opposite Direction => Relative Speed = 80 + 120 = 200 km/h

Time to Cross = 12 s

Calculation:

=> Relative Speed = 80 + 120 = 200 km/h

=> Relative Speed in m/s = 200 × (5/18) = 1000/18 = 500/9 m/s

=> Total Distance (L1 + L2) = Relative Speed × Time

=> 300 + L2 = (500/9) × 12

=> 300 + L2 = 500 × (4/3) = 2000/3

=> L2 = (2000/3) − 300

=> L2 = (2000 − 900) ÷ 3

=> L2 = 1100 ÷ 3 ≈ 366.67 m

Therefore The correct answer is 366.67 m.

Additional Information

Relative Speed in Same Direction

When two objects move in the same direction with speeds u and v (where u > v), their relative speed is (u − v).

Conversion of Speed Units

To convert speed from km/h to m/s, multiply the value by 5/18. To convert from m/s to km/h, multiply by 18/5.

Train Crossing a Stationary Object

When a train of length L crosses a stationary point object like a pole or a standing man, the distance covered is exactly equal to the length of the train L. Time taken = L ÷ Speed of the train.

Q20. Answer: (a) 2

Given →

Position of Neha from right = 8th

position of Abhishek from left= 20th

Number of persons between two different persons = [(Position of person from left + Position of person from right) - Total number of person] - 2

=> [(20 + 8) -24] - 2

=> [28 - 24] - 2

=>4 - 2

=>2

Thus, 2 Students are standing between Neha and Abhishek.

Hence, the correct answer is "2".

Q21. Answer: (c) VEM84

The logic followed here is :

Hence, the correct answer is "VEM84".

Q22. Answer: (a) Gentle massage with warm pads

The correct answer is Gentle massage with warm pads.

Key Points

• Muscle cramps occur when one, part of one, or multiple of your muscles feel like they are constricting or tightening without your conscious involvement and you are unable to get them to release.

• In order to relieve the pain associated with a muscle cramp, heat should be applied as soon as the muscle begins to spasm.

• You can apply an ice pack or a bag of ice to the cramping muscle once the discomfort has somewhat subsided after applying heat.

• Therefore, the correct answer is "Gentle massage with warm pads".

Additional Information

• Applying a pain reliever ointment is only possible after done with heating treatment.

• Ice pack will also be effective only when the pain is decreased by heating treatment.

• Drinking warm sweet milk or tea will only help to settle the mind but in case of muscle cramps it will just do nothing.

Q23. Answer: (b) ©TBF©

Given → Number/symbol and their codes:-

Number/symbol	**6**	**%**	**8**	**9**	**@**	**$**	**5**	**4**	**^**	**•**	**#**	**3**	**7**	**9**
Code Letter	G	O	H	Q	T	M	A	B	L	M	F	S	Q	R

Conditions for coding the group elements

S. No	**Conditions**	**Result**
1.	the first element is a symbol and the last element is a number	codes for these two (the first and the last elements) are to be interchanged
2.	the first element is an odd number and the last element is an even number	the first and last elements are to be coded as ©.

3.	both the second and third elements are perfect squares	the third element is to be code for the second element

In 3 @ 4 # 4 :-

Condition 1: Doesn't follow → First element is not a symbol but it is a number and the last element is a number.

Condition 2: Follows → First element is an odd number and last element is an even number. Therefore, both first and last element are to be coded as ©.

Condition 3: Doesn't follow → Both the second and third element are symbols.

Thus, the code for 3 @ 4 # 4 is:-

Number/symbol	**3**	**@**	**4**	**#**	**4**
Code Letter for Number/symbol	©	T	B	F	©

Hence, the correct answer is "©TBF©".

Q24. Answer: (b) 15

Given number → 5374816

• 2 is added to each odd digit.

• 2 is subtracted from each even digit.

The pattern followed here is:

Now,

• 2nd number from the left is 5.

• 2nd number from the right is 3.

Their product is 5 × 3 = 15.

Hence, the correct answer is "15".

Q25. Answer: (d) 2 : 3

Given:

• Total no. of students=2400

• Percentage of students from houses P, Q, R, S, T, and U are 24%, 21%, 16%, 12%, 18%, and 9% respectively.

Concept used:

• No. of students = Total no. of students × percentage

Calculations:

We know that,

• No. of students in house S = Total no. of students × percentage = 2400 × 12%= (2400 × 12)/100= 288

• No. of students in house T = Total no. of students × percentage = 2400 × 18%= (2400 × 18)/100= 432

Now,

The ratio of students in House S to students in House T = No. of students in house S: No. of students in house T = 288 : 432 = 2:3

Therefore, the correct answer is 'option 4'.

Shortcut TrickPercentage of students in house S = 12%

Percentage of students in house T = 18%

Ratio = 12 : 18

2 : 3

Q26. Answer: (b) Brine

The correct answer is Brine.

Key Points

• Sodium hydroxide

• Sodium hydroxide is industrially produced as a 50 percent solution by variations of the electrolytic chloralkali process. Chlorine gas is also produced in this process. Solid sodium hydroxide is obtained from this solution by the evaporation of water.

• Various methods of preparation of sodium hydroxide are -

• Castner-Kellner Process

• In the Castner-Kellner method, NaOH is prepared by the electrolysis of an aqueous solution of NaCl (Brine).

• Castner-Kellner cell- It is a rectangular tank of steel. Inside of the tank is lined with 'ebonite.' The anode is made of titanium. A

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flowing layer of mercury Hg at the bottom of the tank serves as the cathode.

• When an electric current is passed through the brine, +ve and -ve ions migrate toward their respective electrodes. Na+ ions are discharged at the mercury cathode.

• The sodium deposited in mercury forms Sodium Amalgam. The chlorine produced at the anode is removed from the top of the cell. reaction at cathode Na+ ions are discharged in preference to H+ ions due to high overvoltage.

Q27. Answer: (a) Business Cycle

The correct answer is Business Cycle.

Key Points

• Business cycles are one sort of variation that can be seen in a country's overall economic activity.

• It is a pattern of booms that occur roughly at the same time throughout various economic activities, followed by contractions that are equally widespread (recessions).

• An illustration of an economic cycle is the business cycle.

• Therefore, the correct option is "Business Cycle".

Additional Information

• A production function in economics describes the technological relationship between the amounts of physical inputs and the amounts of output of commodities.

• According to an economics theory, people construct their expectations for the future based on the past. This process is known as adaptive expectations.

Q28. Answer: (b) Both I and II strengthen the statement.

Statement: Unemployment among youth has emerged as the biggest challenge in post-COVID-19 times.

Argument I: Many small-scale industries stopped working during the COVID period at the cost of lockdown. This leaves many youth working in small-scale industries unemployed. Lack of capital inflow toward SSI lead to dy-function. This further strengthen unemployment. → Argument I strengthens the statement.

Argument II: People do not want to work in small-scale industries. This could lead to youth unemployment because of their unwillingness to make use of the opportunities in the small-scale industries due to lack of social security cover. → Argument II strengthens the statement.

Hence, the correct answer is "Both I and II strengthen the statement."

Q29. Answer: (c) 2 lakh

Given:

• Total tourist traffic is 20 lakhs.

• No. of tourists visiting from UP, Haryana, Rajasthan, and others are 10%, 40%, 30%, and 20% respectively.

Concept used:

• No. of tourists= percentage× total tourist traffic

Calculations:

We know that,

• No. of tourists from Haryana= percentage× total tourist traffic= 40% × 20 lakh= (40 × 20)/100= 8 lakhs

• No. of tourists from Rajasthan= percentage× total tourist traffic= 30% × 20 lakh= (30 × 20)/100 = 6 lakhs

Difference between the no. of tourists visiting from Haryana and Rajasthan= No. of tourists from Haryana-No. of tourists from Rajasthan= 8 - 6 = 2 lakhs

Therefore, the correct answer is 'option 3'.

Q30. Answer: (a) Only conclusion IV follows

Given statements:

1. D ≥ S

2. X < W

3. S = J

4. W >Y

5. X > D

6. J ≥ E

Conclusions:

I. D > Y → False (there is no direct and definite relation between D and Y)

II. D = E → False (D ≥ S = J ≥ E; D can be greater than or equal to E which is not conclusive)

lll. E = S → False (D ≥ S = J ≥ E; S can be greater than or equal to E which is not conclusive)
IV. W > J → True (W > X > D ≥ S = J; There is a direct and definite relation between W and J)
Hence, the correct answer is "Only conclusion IV follows".

Q31. Answer: (c) 30

The logic followed here is:
The missing number in the series is 30.
Hence, the correct answer is "30".

Q32. Answer: (d) 0.725% loss

Shortcut Trick
Let Cost Price (CP) be 100.
Marked Price (MP) = 100 + 10% of 100 = 110.
Net discount for two 5% successive discounts = 5 + 5 − (5 × 5) ÷ 100 = 10 − 0.25 = 9.75%.
Selling Price (SP) = 110 × (100 − 9.75) ÷ 100 = 110 × 0.9025 = 99.275.
Loss percentage = CP − SP = 100 − 99.275 = 0.725% loss.
Therefore The correct answer is 0.725% loss.
Alternate Method
Given → Markup% = 10%, Successive Discounts = 5% and 5%.
Formulas: SP = CP × (100 + Markup%) ÷ 100 × (100 − D1%) ÷ 100 × (100 − D2%) ÷ 100.
=> Assume CP = 100 units.
=> MP = 100 × (110 ÷ 100) = 110 units.
=> SP after 1st discount = 110 × (95 ÷ 100) = 104.5 units.
=> Final SP after 2nd discount = 104.5 × (95 ÷ 100) = 99.275 units.
=> Loss = CP − SP = 100 − 99.275 = 0.725 units.
=> Loss% = (0.725 ÷ 100) × 100 = 0.725%.
Therefore The correct answer is 0.725% loss.
Additional Information
Marked Price and Discount
The price listed on the product is the Marked Price (MP). Discount is always calculated on the MP: SP = MP − Discount.
Successive Percentage Change
For two successive changes of x% and y%, the net change is given by the formula: [x + y + (xy ÷ 100)]%.

Q33. Answer: (a) RVH : UYK

Logic is followed in the Given cluster:
Let's check options
Option 1:
Option 2:
Option 3:
Option 4:
The cluster RVH : UYK only follows the given logic.
Hence, the correct answer is "RVH : UYK".

Q34. Answer: (c) 5928

Given numbers:
• 23 35 76 87 45 28 49 98 56 34 37 48 78 75 64 89 73.
Calculation:
3^(rd) number from the left = 76
5^(th) number from the right = 78
Their product = 76×78= 5928
Therefore, the correct answer is '5928'.

Q35. Answer: (d) 73^(rd)

The correct answer is 73rd.

Key Points

• The DPSP's article 40 states that "State shall take steps to organize village panchayats and invest them with such rights and authority as may be necessary to allow them to function as units of self-government." This revision puts that provision into practice.

• States have been allowed ample latitude to implement the Panchayati Raj System while taking into account local factors such as geography, politics, and administration.

• The "The Panchayats" Part IX was added to the constitution as part of the 73rd Amendment in 1992, and it contains provisions from Articles 243 to 243(O).

• The 73^(rd) Amendment Act gave state governments the authority to take the necessary actions to formalize gram panchayats and enable them to function as self-governing entities.

• Every state is now required, in accordance with Article 243-B, to create panchayats within its borders.

• The state governments are required by Article 243-G to delegate powers, responsibilities, and authority to the panchayats.

• The gram panchayats are elected for a definite term of five years.

• The mechanism to hold independent elections for village panchayats have been made available to state election commissioners.

• The due representation of women and SC/STs is provided for under Article 243-D.

Additional Information

• 74th Constitutional Amendment Act:

• The 74th Constitutional Amendment Act of 1992 established the Municipalities or Urban Local Governments system as a constitutional entity.

• Municipalities are now governed by the Constitution's justiciable provisions.

• According to the terms of the legislation, state governments are required by the constitution to implement the new system of municipalities [Article 243 Q].

• In order for urban governments to properly serve as local government units, the legislation intends to revitalize and strengthen them.

• 83rd Constitutional Amendment Act:

• The 83rd Amendment Act mandated that all States update their local legislation to be in compliance with the new Constitutional provisions within a year of the Act's commencement.

• 7th Constitutional Amendment Act:

• The 7th Amendment was added to the Constitution to replace the previous structure and organize state segregation.

• It offered term lengths for various offices and aided in the nomination of governors in two or more states.

• Additionally, it created specific criteria for the states of Punjab and Andhra Pradesh depending on the significance or assertiveness of languages.

Q36. Answer: (b) 1 : 1

Shortcut Trick

In similar triangles, the shape remains identical while only the size changes.

By the fundamental property of similarity, all corresponding angles of similar triangles are always equal.

Since the angles are equal, their ratio is always 1 : 1, regardless of the ratio of their sides.

Therefore The correct answer is 1 : 1.

Alternate Method

Given:

Ratio of corresponding sides of two similar triangles = 3 : 1

Formula Used:

For two triangles ΔABC and ΔPQR, if ΔABC ~ ΔPQR, then:

1. AB/PQ = BC/QR = CA/RP (Sides are proportional)

2. angle A = angle P, angle B = angle Q, angle C = angle R (Corresponding angles are equal)

Calculations:

=> Let the two similar triangles be Δ1 and Δ2.

=> According to the property of similarity, the corresponding angles of Δ1 and Δ2 must be congruent (equal in measure).

=> If an angle in Δ1 is x, then the corresponding angle in Δ2 is also x.

=> Ratio of corresponding angles = x : x

=> Ratio = 1 : 1

Therefore The correct answer is 1 : 1.

Additional Information

Ratio of Areas

The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides (e.g., $3^2 : 1^2 = 9 : 1$).

Ratio of Perimeters

The ratio of the perimeters, altitudes, medians, or angle bisectors of two similar triangles is equal to the ratio of their corresponding sides.

AA Similarity Criterion

Two triangles are similar if two angles of one triangle are equal to two angles of the other triangle, which automatically makes the third pair of angles equal.

2

Q37. Answer: (b) Lymph

The correct answer is Lymph.

Key Points

• Lymph is actually a fluid which is present in the lymphatic system.
• Lymph has no colour and it contain specialized lymphocytes, which control the immune responses of the body.
• Lymph also carry nutrients, hormones, etc.
• lymph can absorb fat in the intestinal villi.

Additional Information

• Plasma
• The liquid portion of blood is called Plasma.
• About 55% of our blood is plasma.
• The remaining 45% are red blood cells, white blood cells, and platelets which are suspended in the plasma.
• Platelets
• The major function of Platelets is to prevent and stop bleeding.
• When a blood vessel is damaged, then the body sends signals to platelets this cause them to travel to the injured area.
• Once the platelets arrive at the site, they clump together to form a clot that helps stop bleeding.
• Veins
• The first purpose of vein is to collect oxygen-poor blood throughout your body and carry it back to your heart.
• The another purpose is to carry oxygen-rich blood from your lungs to your heart.

Q38. Answer: (d) real and diminished

The correct answer is real and diminished.

Key Points

• A convex lens is thicker at the center than at the edges.
• It is called a converging lens because the rays of light that pass through it are brought closer together (they converge).
• When parallel rays of light pass through a convex lens the refracted rays converge at one point called the principal focus.
• The distance between the principal focus and the center of the lens is called the focal length.
• The ray diagram

Additional Information

• The image formed in the convex lens become real and enlarged when the object is placed upside down between optical centre and focal length.
• The convex lens always form virtual and dimiished image irrespective of the position.
• The convex lens form virtual and enlarged image when the object is between focus and lens.

Q39. Answer: (c) Only conclusion I follows

Given Statements:

1. Some apricots are peaches.
2. Some kiwis are apricots.
3. All apricots are sweet-limes.

Calculation:

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Let's draw a Venn diagram after considering the above statement.

Conclusions 1: Some sweet limes are kiwis. → Follows (as some kiwis are apricots and all apricots are sweet-limes. So the conclusion is definitely true)

Conclusion 2: No peach is sweet lime. → Does not Follows (as some kiwis are apricots and all apricots are sweet-limes; also some apricots are peaches. so the conclusion is definitely false)

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

Q40. Answer: (c) 40 years

The correct answer is 40 years.

Key Points

• Atal Pension Yojana (APY), a pension scheme for citizens of India is focused on unorganized sector workers.

• It was launched on 09.05. 2015.

• Depending on the subscribers' payments, a guaranteed minimum pension of Rs. 1,000, Rs. 2,000, Rs. 3,000, Rs. 4,000, or Rs. 5,000 per month will be provided under the APY at the age of 60.

• The subscriber should be between the ages of 18 and 40.

• Therefore, the correct option is 40 years.

Additional Information

• The spouse of the contributor is entitled to the Atal Pension Yojana death benefits. The spouse, who is the default nominee, receives the pension automatically upon the contributor's passing.

• The retirement benefit is the primary Atal Pension Yojana benefit. The amount of the monthly pension will be determined by the contributions made.

• The government is providing tax benefits on donations made to the Atal Pension Yojana in order to encourage people to invest in the program.

Q41. Answer: (d) Single citizenship

The correct answer is "Single citizenship".

Key Points

• The Constitution is a body of laws and regulations that establishes the framework for a state's government and specifies and establishes the relationships between the executive, legislative, judicial, central, and local branches of government.

• Single citizenship prevents a person from exercising state citizenship rights.

• This idea is used to unite people from various cultural and spiritual backgrounds. Single citizenship simply enables citizens to speak for their country.

Additional Information

• There are total of 12 features which are borrowed from the Constitution of the United Kingdom, written below:

1. Parliamentary system or parliamentary form of government

2. Legislative process or law-making procedure.

3. Bicameralism

4. Single citizenship (Articles 5-11)

5. Rule of law

6. Parliamentary privileges

7. Cabinet system

8. Political party system

9. Writs (Article 32 and Article 226)

10. Real executives

11. The nominal head of state

12. Collective responsibility

• Concurrent list:

• The concurrent List was taken from Australia's Constitution and included in the Indian Constitution.

• The items in this list are subject to legislation from both the federal government and state governments.

• Directive principles of state policy:

• The Spanish Constitution served as the inspiration for the Irish Constitution's Directive Principles of State Policy (DPSP) which is adapted from the Indian Constitution.

• Article 45 of the Irish Constitution gave rise to the idea of DPSP.

• Fundamental duties:

• The concept of Fundamental Duties was inspired by the Soviet Constitution (USSR), now known as Russia.
• The Indian Constitution now includes 10 Fundamental Duties thanks to the 42nd Amendment Act of 1976.
• Later, the 11th Fundamental Duty was included in the list by the 86th Amendment Act of 2002.

Q42. Answer: (c) Yellow

The correct answer is Yellow.

Key Points

• When a solution of potassium iodide is added to a solution of lead nitrate taken in a test tube.
• There observe a precipitation of a yellowish solid is observed.
• This yellowish solid is lead iodide.
• Potassium nitrate is formed along with lead iodide. This is a double displacement reaction.
• The reaction is -Pb(NO3)2 +KI → PbI2 (yellow)+2KNO3

Q43. Answer: (d) 12

Shortcut Trick

For four numbers a, b, c, d in proportion, the logic is Product of Extremes = Product of Means.

Direct calculation => 2 × y = 3 × 8

y = (3 × 8) ÷ 2 = 24 ÷ 2 = 12

Therefore The correct answer is 12.

Alternate Method

Given: Numbers 2, 3, 8 and y are in proportion.

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

Calculations:

=> 2/3 = 8/y

=> 2 × y = 8 × 3

=> 2y = 24

=> y = 24 ÷ 2

=> y = 12

Therefore The correct answer is 12.

Additional Information

Fourth Proportional

If a, b, c, d are in proportion, d is the fourth proportional to a, b, and c. It is calculated as d = (b × c) ÷ a.

Mean Proportional

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

Continued Proportion

Numbers a, b, c are in continued proportion if a/b = b/c, which implies $b^2 = ac$.

Q44. Answer: (d) 3

Shortcut Trick

Since −2/3 is a root of the equation, it must satisfy the equation. Substitute x = −2/3 directly:

k(−2/3)2 − 13(−2/3) − 10 = 0

=> 4k/9 + 26/3 − 10 = 0

=> 4k + 78 − 90 = 0

=> 4k = 12 => k = 3

Therefore The correct answer is 3.

Alternate Method

Given:

Quadratic Equation: kx2 − 13x − 10 = 0

Root (x): −2/3

Formula Used:

If α is a root of the quadratic equation ax2 + bx + c = 0, then substituting x = α satisfies the equation: aα2 + bα + c = 0.

Calculations:

Substitute x = −2/3 in the given quadratic equation:

=> k × (−2/3)2 − 13 × (−2/3) − 10 = 0

=> k × (4/9) + 26/3 − 10 = 0

Multiply the entire equation by 9 to eliminate the denominators:

=> 9 × [k × (4/9)] + 9 × (26/3) − 9 × 10 = 0

=> 4k + 3 × 26 − 90 = 0

=> 4k + 78 − 90 = 0

=> 4k − 12 = 0

=> 4k = 12

=> k = 12 ÷ 4

=> k = 3

Therefore The correct answer is 3.

Additional Information

Root of an Equation

Any value of the variable that makes the polynomial equation equal to zero when substituted is called a root or zero of the equation.

Relation between Roots and Coefficients

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

Discriminant & Nature of Roots

The discriminant D = b2 − 4ac determines the nature of the roots. If D ≥ 0, the roots are real; if D < 0, the roots are imaginary.

Q45. Answer: (b) 10

As per the given information,

The shaded part represents → students are there who are also teachers but NOT from India = 10

Hence, the correct answer is "option (2)".

Q46. Answer: (c) 27

Shortcut Trick

Calculate the squares of the numbers: 9, 16, 25, 36, and 49.

Sum of terms = 9 + 16 + 25 + 36 + 49 = 135.

Average = Total Sum ÷ Count = 135 ÷ 5 = 27.

Therefore The correct answer is 27.

Alternate Method

Given: The terms are 3^2, 4^2, 5^2, 6^2, and 7^2.

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

=> Square of 3 = 9

=> Square of 4 = 16

=> Square of 5 = 25

=> Square of 6 = 36

=> Square of 7 = 49

=> Sum = 9 + 16 + 25 + 36 + 49 = 135

=> Number of observations = 5

=> Average = 135 ÷ 5 = 27

Therefore The correct answer is 27.

Additional Information

Sum of squares of first n natural numbers

The sum of the squares of the first n natural numbers is given by the formula: [n × (n + 1) × (2n + 1)] ÷ 6.

Average of squares of first n natural numbers

The average of the squares of the first n natural numbers is: [(n + 1) × (2n + 1)] ÷ 6.

General Average Formula

For any set of n numbers, the average is always the Arithmetic Mean, calculated as Total Sum ÷ n.

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Q47. Answer: (d) Over Antarctica

The correct answer is "Over Antarctica".

Key Points

• The protective ozone layer in the stratosphere is thinned, causing the ozone hole.

• Ozone holes detected in the late 1990s and early 2000s are significantly larger than the 2021 Antarctic ozone hole, while being larger than average.

• In certain cases, the ozone hole over Antarctica has gotten so big that it is affecting Australia, New Zealand, Chile, Argentina, and parts of South Africa.

• Therefore, the correct option is "Over Antarctica".

Additional Information

• The ozone "hole," formerly thought to pose the greatest threat to planetary life, is now anticipated to be fully repaired by 2066.

Q48. Answer: (b) 5

The pattern is, the number to be interchanged is,

Now,

Therefore their sum is 2+3 = 5

Hence, the correct answer is "5".

Q49. Answer: (c) 10.8

Shortcut Trick

Speed = 450 m ÷ 150 sec = 3 m/s.

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

Speed = 3 × (18 ÷ 5) = 54 ÷ 5 = 10.8 km/hr.

Distance in 1 hour = Speed × 1 hour = 10.8 km.

Therefore The correct answer is 10.8 km.

Alternate Method

Given:

Distance = 450 m, Time = 2 minutes 30 seconds

Formula Used:

Speed = Distance ÷ Time

1 km = 1000 m, 1 hour = 3600 seconds

Calculations:

=> Time in seconds = (2 × 60) + 30 = 150 seconds

=> Speed in m/s = 450 ÷ 150 = 3 m/s

=> Distance in 1 hour (3600 seconds) = 3 × 3600 = 10800 m

=> Distance in km = 10800 ÷ 1000 = 10.8 km

Therefore The correct answer is 10.8 km.

Additional Information

Unit Conversion for Speed

To convert speed from m/s to km/hr, multiply by 18/5. To convert km/hr to m/s, multiply by 5/18.

Basic Speed Formula

Speed = Distance ÷ Time. Ensure all units are consistent (e.g., meters with seconds, kilometers with hours) before calculation.

Q50. Answer: (a) North - West

Drawing the diagram according to the given information,

1. Jyoti starts from the mall and drives 4 km towards West.
2. She then takes a left turn, and drives 8 km.
3. Then again turns left and drives 24 km.
4. She then takes a left turn and drives 6 km.
5. She then turns left, drives 6 km, and reaches her home.

Here, the Mall is in 'North-West' with respect to his Home.

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

Q51. Answer: (b) 24

According to the question,

Position of Suhani from front = 8^(th)

Position of Syma from back= 8^(th)

Students between Suhani and Syma= Total students- (Position of Suhani from front + Position of Syma from back) = 40- (8+8) = 24

Thus, '24' students are standing between Suhani and Syma.

Hence, the correct answer is "24".

Q52. Answer: (d) 52

The logic followed here is,

Thus, the correct answer is "52".

Q53. Answer: (b) 128

The logic here is:

The pattern is: (First Number × half of the First number) = Second term

So, the missing no. is 128.

Hence, the correct answer is "128".

Q54. Answer: (c) a moving magnet induces an EMF in the closed loop of a conductor

The correct answer is a moving magnet induces an EMF in the closed loop of a conductor.

Key Points

• The phenomenon of electromagnetic induction is the current induced in a coil due to relative motion between a magnet and the coil.

• It was discovered by Michael Faraday.

Additional Information

Faraday's First Law of Electromagnetic Induction:

• It states that, "whenever a conductor is placed in a varying magnetic field, an electromotive force is induced. If the conductor circuit is closed, a current is induced, which is called induced current".

• The magnetic field intensity in a closed loop can be changed

• By rotating the coil relative to the magnet.

• By moving the coil into or out of the magnetic field.

• By changing the area of a coil placed in the magnetic field.

• By moving a magnet towards or away from the coil.

Faraday's Second Law of Electromagnetic Induction:

• It states that, "the induced emf in a coil is equal to the rate of change of flux linkage".

• The flux linkage is the product of the number of turns in the coil and the flux associated with the coil.

• The formula of Faraday's 2nd law is given by E = -Ndφ/dt

• Where E is the electromotive force, Φ is the magnetic flux, and N is the number of turns.

Q55. Answer: (c) 13

Shortcut Trick

In any data set, the Mode is the observation that occurs most frequently.

By inspection, we count the occurrences: 11 (1 time), 13 (3 times), 15 (1 time), 17 (2 times), 18 (2 times), 19 (1 time).

Since 13 repeats the maximum number of times, it is the mode.

Therefore The correct answer is 13.

Alternate Method

Given:

Marks scored by 10 students: 17, 13, 18, 11, 15, 13, 19, 18, 13, 17

Formula Used:

Mode = Value with the highest frequency (maximum repetition) in the data set.

Calculations:

=> Frequency of 11 = 1

=> Frequency of 13 = 3

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=> Frequency of 15 = 1

=> Frequency of 17 = 2

=> Frequency of 18 = 2

=> Frequency of 19 = 1

=> Maximum frequency is 3, which corresponds to the mark 13.

Therefore The correct answer is 13.

Additional Information

Arithmetic Mean

It is the average of all observations. Mean = (Sum of all observations) ÷ (Total number of observations).

Median

The middle-most value of the data when arranged in ascending or descending order. For even n, Median = Average of (n/2)^(th) and (n/2 + 1)^(th) terms.

Empirical Formula

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

Multimodal Data

A data set can have more than one mode (Bimodal or Trimodal) if multiple values share the highest frequency.

Q56. Answer: (d) Jute Industry

The correct answer is "Jute Industry".

Key Points

• West Bengal has a jute industry that dates back to the 17th century.

• West Bengal accounts for 71% of land in the country that is under jute cultivation. Presently, jute from West Bengal makes up about 73% of the country’s production.

• The first jute mill was built in Rishra on the river in 1855, which is one of many reasons why the jute industry is situated close to the Hooghly.

1. The river offered water for the retting of fiber, washing, and dyeing processes of jute, as well as an efficient way to convey the fiber to other locations.

2. The area beside the river was fertile for jute farming.

Additional Information

• In Gujarat's Porbandar, the first cement factory in India was established. Currently, Madhya Pradesh is India's top cement-producing state. Gujarat, Rajasthan, and Andhra Pradesh come next.

• Iron and steel industry is an important industry in India. India ranks second in the world in production of iron and steel. Odisha is the largest iron ore-producing state in India.

• India's textile sector is widespread across the nation. Cotton is mostly produced in the Indian states of Gujarat, Tamil Nadu, and Maharashtra.

Q57. Answer: (d) 729

Shortcut Trick

For a cube with edge length (a), the Volume is simply the cube of its side.

Given edge = 9 m.

Volume = 9^3 = 9 × 9 × 9 = 729.

Therefore The correct answer is 729 m^3.

Alternate Method

Given:

Edge of the cube (a) = 9 m.

Formula Used:

Volume of a Cube = a^3

Calculations:

=> Volume = (9 m) × (9 m) × (9 m)

=> Volume = 81 × 9

=> Volume = 729 m^3

Therefore The correct answer is 729 m^3.

Additional Information

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Total Surface Area of Cube

The total area of all six faces is $6a^2$. For this cube, it would be $6 \times 81 = 486$ m².

Diagonal of a Cube

The longest distance between two opposite corners is given by $a\sqrt{3}$. For this cube, it is $9\sqrt{3}$ m.

Lateral Surface Area

The area of the four side faces (excluding top and bottom) is $4a^2$.

Q58. Answer: (a) Agricultural Sciences

The correct answer is "Agricultural Sciences".

Key Points

• Coromandel International, a fertilizer manufacturer, bestows the Borlaug Award.

• This honour is given to Indian scientists in recognition of their work and contributions to the environmental and agricultural fields.

• This prize was established in 1972 and is named in honour of Norman Borlaug, a Nobel Prize winner known as the "Father of the Green Revolution."

Additional Information

Fields	Awards
Physical Sciences	Infosys award
Chemical Sciences	ACS National Awards
Energy Sciences	ENI Award

Q59. Answer: (d) Chlorenchyma - Has chlorophyll photosynthesis (leaves) Aerenchyma - Has air spaces (aquatic plants) and hel...

The correct answer is Chlorenchyma - Has chlorophyll photosynthesis (leaves), Aerenchyma - Has air spaces (aquatic plants) and helps them to float.

Key Points

• Sclerenchyma is found in the covering of seeds and nuts, veins of leaves, around the vascular tissues in stems.

• Simple Permanent tissues:

• The tissues which are specialized to offer elasticity, flexibility, and strength to the plant but have lost their ability to distribute.

• Simple Permanent Tissue can be classified into the parenchyma, sclerenchyma, collenchyma, based on their purpose.

Additional Information

• Parenchyma:

• These are living polygonal cells with a big central vacuole & intercellular spaces amidst them.

• Parenchymatous cells are responsible to create ground pith & tissue.

• It comprising of chloroplasts and that's why it is termed as chlorenchyma & it helps in photosynthesis.

• Parenchyma which comprises of The big air voids is called aerenchyma. 'Buoyancy' is the main purpose of aerenchyma.

• Some of these cells perform as storage chambers for starch in fruits & vegetables.

• Collenchyma:

• These have minute intercellular gaps & are stretched out living cells.

• Their cell walls are made up of cellulose & pectin.

• Collenchyma is found in the marginal regions of stems & leaves.

• It offers mechanical support in plants & offers flexibility with the structural framework.

• Sclerenchyma:

• In their cell wall, these are dead cells with lignin deposits

• Sclerenchyma is found in the covering of seeds and nuts, veins of leaves, around the vascular tissues in stems.

• It provides strength to the plant & they have no intercellular gaps.

Q60. Answer: (a) 3 km towards the east

Draw the diagram according to the given information which is as follows,

1. Starting point is Y.

2. Drives 8 km towards the north and then take a right turn and drive 12 km.

3. Then again take a right turn and drives 11 km.

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4. Then again take a right turn and drives 15 km.

5. Finally take a right turn and drive 3 km and stop at point Z.

So, he needs to drive 3 km towards east to reach Point Y from Point Z.

Hence, the correct answer is "Option 1".

Q61. Answer: (c) √3, 5/(√3)

Shortcut Trick

For a quadratic equation $ax^2 + bx + c = 0$, find two numbers whose product is a × c and sum is b.

Product = √3 × 5√3 = 15 | Sum = −8.

Two such numbers are −5 and −3 (since −5 − 3 = −8 and −5 × −3 = 15).

Roots = −(factor 1)/a and −(factor 2)/a => −(−5)/√3 and −(−3)/√3.

Roots = 5/√3 and 3/√3 = √3.

Therefore The correct answer is √3, 5/√3.

Alternate Method

Given Equation: $\sqrt{3}\,x^2 - 8x + 5\sqrt{3} = 0$

We use the factorization method by splitting the middle term (−8x).

=> $\sqrt{3}\,x^2 - 3x - 5x + 5\sqrt{3} = 0$

=> $\sqrt{3}\,x(x - \sqrt{3}) - 5(x - \sqrt{3}) = 0$

=> $(x - \sqrt{3})(\sqrt{3}\,x - 5) = 0$

Now, set each factor to zero:

=> $x - \sqrt{3} = 0 \rightarrow x = \sqrt{3}$

=> $\sqrt{3}\,x - 5 = 0 \rightarrow x = 5/\sqrt{3}$

Thus, the roots are √3 and 5/√3. Comparing this with the options, it matches option (3).

Therefore The correct answer is √3, 5/√3.

Additional Information

Discriminant and Nature of Roots

The discriminant is $D = b^2 - 4ac$. If D > 0, the equation has two real and distinct roots. In this case, $D = (-8)^2 - 4(\sqrt{3})(5\sqrt{3}) = 64 - 60 = 4$.

Relationship between Roots and Coefficients

For $ax^2 + bx + c = 0$, the sum of roots = −b/a and the product of roots = c/a. Here, Sum = 8/√3 and Product = (5√3)/√3 = 5.

Quadratic Formula

The roots can also be found using $x = [-b \pm \sqrt{D}] / 2a$. Here, $x = [8 \pm \sqrt{4}] / (2\sqrt{3}) = [8 \pm 2] / (2\sqrt{3})$.

Q62. Answer: (a) V = R/I

The correct answer is V = R/I.

Key Points

• Ohm’s law states that the current through a conductor between two points is directly proportional to the voltage across the two points.

• Voltage = Current × Resistance

• V = I × R

• V = voltage, I = current and R = resistance

• The SI unit of resistance is ohms and is denoted by Ω.

Additional Information

• Limitations of ohms law:

• Ohm’s law is not applicable to unilateral networks. Such types of the network consist elements like a diode, transistor, etc.

• Ohm’s law is also not applicable to non – linear elements. Non-linear elements are those which do not have current exactly proportional to the applied voltage that means the resistance value of those elements changes for different values of voltage and current. Examples of non – linear elements are the thyristor, arc lamp.

Q63. Answer: (d) Brahmaputra

The correct answer is "Brahmaputra".

Key Points

• The river Lohit runs through both China and India.

• The Zayu River is another name for the Lohit River.

• The Brahmaputra River receives water from the Lohit River.

• Therefore, the correct answer is "Brahmaputra".

Important Points

• The Brahmaputra river system is one of the largest rivers in the world. In the Tibet region, it is known by the name of Yarlung Tsangpo. It enters by the names of Siang and Dihang in India.

• It flows in Bangladesh by the name of Jamuna. Finally, it merges with the Ganga river.

• The primary tributaries of the Brahmaputra river include - the Dhansiri river, Lohit river, Dibang river, Subansiri river, Kameng river, Sankosh river, etc.

Additional Information

• The Bhupen Hazarika Setu, also known as the Dhola-Sadiya Bridge, is a beam bridge that crosses the Lohit River in India.

• The Brahmaputra River crosses international borders as it travels through Bangladesh, India, and Tibet.

• The Brahmaputra River is the 15th-longest and ninth-largest river in the world by discharge.

Q64. Answer: (d) 6

Shortcut Trick

Age difference between Neeraj and sister = 12 − 3 = 9 years.

When the sister is half of Neeraj's age, the difference (9 years) must equal the sister's age.

Sister's age then = 9 years. Current age = 3 years.

Years required = 9 − 3 = 6 years.

Therefore The correct answer is 6 years.

Alternate Method

Given: Current age of Neeraj = 12 years; Current age of sister = 3 years.

Let the required number of years be x.

=> Age of Neeraj after x years = 12 + x

=> Age of sister after x years = 3 + x

According to the question:

=> 3 + x = (1/2) × (12 + x)

=> 2 × (3 + x) = 12 + x

=> 6 + 2x = 12 + x

=> 2x − x = 12 − 6

=> x = 6

Therefore The correct answer is 6 years.

Additional Information

Constant Age Difference

The numerical difference between the ages of two persons remains constant regardless of the number of years passed.

Ratio of Ages

While the difference is constant, the ratio of their ages changes over time. As time increases, the ratio of the elder person to the younger person's age generally approaches 1:1.

Verification Method

Always verify by adding the result to original ages: (3+6) = 9 and (12+6) = 18. Since 9 is half of 18, the answer is correct.

Q65. Answer: (a) current increases

The correct answer is current increases.

Key Points

• Ohm’s law: It gives the relation between current, voltage, and resistance in a circuit.

• Ohm’s law states that the current through a conductor between two points is directly proportional to the voltage across the two points i.e. V prop. to I

• Therefore, V = IR

Where R is the resistance.

• This law is valid only for a conductor at the same physical and temperature conditions.

• For a conductor at a constant temperature, the plot of the V-I graph will be a straight line through the origin.

• The slope of the V-I graph gives the value of resistance.

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Additional Information

• An electrolyte is a substance that contains free ions.

• When potential is applied to an electrolyte, the ions in them start to dissociate. The movement of these ions causes the electric current through an electrolyte.

• As the voltage increases, the number of dissociated ions also increases. This continues until no more dissociation can occur and this voltage will be the highest voltage.

• At this highest voltage, the electrolyte now behaves as a conductor and thus, obeys Ohm's law.

Q66. Answer: (c) 1 April - 31 March 2021-22

The correct answer is "1 April - 31 March 2021-22".

Key Points

• In the midst of the COVID-19 pandemic, the Finance Minister, Ms. Nirmala Sitharaman, unveiled the Budget 2021–22 on February 1, 2021.

• Approximately six months before the budget is presented, in the months of August and September, the budget-making process begins.

• The Budget must then be approved by both Houses of Parliament before the start of the fiscal year, which begins on April 1.

• Therefore, the correct option is "1 April - 31 March 2021-22".

Additional Information

• The general debate of the budget is followed by a more in-depth discussion and vote on the grant requests.

• The government makes the announcement on February 1st so that it can come to pass before the start of the fiscal year in April.

Q67. Answer: (c) Godavari

The correct answer is "Godavari".

Key Points

• It is the second-longest stretch of brownish water in India.

• It is a seasonal river, and in the summer, when it monsoons, it typically dries out and widens.

• This river is the largest peninsular river system in India.

• It is also called Dakshin Ganga.

• It originated from Tryambak hill in the Western Ghats.

• It originates from the Nashik district in Maharashtra.

• Its length is usually 1465 km.

• The main tributaries of Godavari are Pranahita, Indravati and Manjira.

• On the Godavari River, between Kovvur and Rajahmundry, is the largest railroad bridge in Asia.

• Therefore, the correct answer is "Godavari".

Additional Information

• Along these river's banks, there are a lot of pilgrimage sites, including Nasik, Bhadrachalam, and Trimbak.

• The river flows through the states of Madhya Pradesh, Telangana, Andhra Pradesh, and Orissa in a southeasterly direction before emptying into the Bay of Bengal.

• By the river, Rajahmundry develops a lush delta.

Q68. Answer: (a) U

Given → Six cousins P, Q, R, S, T and U, each of a different height.

• Only one cousin's age is less than P's age.

> > > P > __

• Q's age is more than that of S and P but not more than that of R.

R > Q > S, P

• S's age is immediately more than P's age.

R > Q > S > P

• R is younger than U.

U > R > Q > S > P >__

• T is the youngest.

U > R > Q > S > P > T

From the above arrangement, it is clear that U is the oldest among all cousins.

Hence, the correct answer is "U".

Q69. Answer: (b) 50° and 50°

Shortcut Trick

In an isosceles triangle, the angles opposite to the equal sides (base angles) are equal.

Sum of all angles in a triangle = 180°

Sum of two base angles = 180° − Vertex Angle

=> Sum of base angles = 180° − 80° = 100°

=> Each base angle = 100° ÷ 2 = 50°

Therefore The correct answer is 50° and 50°.

Alternate Method

Given:

Vertex angle of the isosceles triangle = 80°

Formula Used:

Sum of interior angles of a triangle = 180°

In an isosceles triangle, if two sides are equal, their opposite angles are also equal.

Calculations:

Let the measure of each base angle be x.

=> x + x + 80° = 180°

=> 2x + 80° = 180°

=> 2x = 180° − 80°

=> 2x = 100°

=> x = 100° ÷ 2

=> x = 50°

Therefore The correct answer is 50° and 50°.

Additional Information

Properties of Isosceles Triangle

Two sides are of equal length, and the angles opposite to these sides are equal in measure.

Angle Sum Property

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

Equilateral Triangle Case

If the vertex angle were 60° in an isosceles triangle, all angles would become 60°, making it an equilateral triangle.

Q70. Answer: (d) Russia

The correct answer is "Russia".

Key Points

• Now, along the Line of Actual Control, both China and India have placed their own S-400 air defence systems.

• By the end of 2023, Russia could provide India with all five regiments of the S-400 air defence system.

• According to the Russian ambassador, Denis Alipov, the delivery of the S-400 Triumf air defence missile systems to India is "proceeding well" and on schedule.

• Therefore, the correct answer is Russia.

Additional Information

• Only the S-400 is able to shield a significantly bigger region from threats that are farther away.

• To defend against Chinese or Pakistani fighter jet or missile assaults India wants S-400 missiles.

Q71. Answer: (c) New Delhi

The correct answer is "New Delhi".

Key Points

• In New Delhi, India, there is a central university known as Shri Lal Bahadur Shastri National Sanskrit University, formerly known as Shri Lal Bahadur Shastri Rashtriya Sanskrit Vidyapeetha.

• The Vidyapeetha was founded on October 8, 1962, and in November 1987, the University Grants Commission accorded it the status of a declared university.

• University provides various Scholarships to Students under various categories-

Additional Information

• Saroj Institute of Technology and Management is located in Lucknow.

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• Jaipur National University is located in Jaipur.
• Bharati Vidyapeeth Deemed University is located in Pune.

Q72. Answer: (a) Arunachal Pradesh

The correct answer is "Arunachal Pradesh".

Key Points

• In order to fight off bad spirits and welcome joyful new beginnings, Losar is celebrated. It's a festival in the spring.
• The Monpa tribe of Arunachal celebrates this three-day holiday with tremendous fervour and reverence.
• Extensive preparations are made, from cleaning and adorning homes to making special offerings for deities.
• Therefore, the correct answer is "Arunachal Pradesh".

Additional Information

• The Ugadi celebration also heralds the start of Andhra Pradesh's spring season the new year's message.
• Onam is Kerala's spring celebration.
• Rogali Bihu is Assam's spring festival.

Q73. Answer: (c) 1

Shortcut Trick

Apply the standard trigonometric identity: sin(A + B) = sin A cos B + cos A sin B.

Here, let A = 32° and B = 58°.

The expression becomes sin(32° + 58°) = sin(90°).

Since sin 90° = 1, the value of the expression is 1.

Therefore The correct answer is 1.

Alternate Method

Given:

Expression: sin 32° cos 58° + cos 32° sin 58°

Formula Used:

cos θ = sin(90° − θ)

sin θ = cos(90° − θ)

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

Calculations:

=> cos 58° = sin(90° − 58°) = sin 32°

=> sin 58° = cos(90° − 58°) = cos 32°

Substitute these values back into the given expression:

=> sin 32° × sin 32° + cos 32° × cos 32°

=> $\sin^2 32° + \cos^2 32°$

=> 1

Therefore The correct answer is 1.

Additional Information

Trigonometric Sum and Difference Formulas

sin(A ± B) = sin A cos B ± cos A sin B and cos(A ± B) = cos A cos B -/+ sin A sin B.

Complementary Angle Trigonometric Ratios

For complementary angles where A + B = 90°, sin A = cos B, tan A = cot B, and sec A = cosec B.

Pythagorean Trigonometric Identity

For any angle θ, $\sin^2\theta + \cos^2\theta = 1$.

Q74. Answer: (a) mechanical energy into electrical energy

The correct answer is mechanical energy into electrical energy.

Key Points

• An electric generator is a device that is used to convert mechanical energy into electric energy.
• It is also known as a dynamo.
• An electric generator works on the Electromagnetic Induction Principle.
• The Principle of Electromagnetic Induction states that when a conductor connected with a changing flux, it will induce an emf across it. The value of induced emf across the conductor depends on the rate of change of flux connected with the conductor.

• An electric generator is generated by rotating a coil inside a magnetic field.

• • When A coil is rotated in a magnetic field by magnetic energy, magnetic flux is changed through the coil.

• And so, EMF is induced in the coil that produces current. So, Electric energy is generated.

Additional Information

• The mechanical energy for electric generators comes from different sources: hydraulic turbines at dams or waterfalls; wind turbines; steam turbines using steam produced with heat from the fossil fuels combustion or from nuclear fission; gas turbines burning gases directly into the turbine.

Q75. Answer: (c) 6.38%

Shortcut Trick

For a dishonest dealer selling at cost price, gain% = (Error ÷ True Value − Error) × 100.

True Value = 1000 gm, Used Value = 940 gm.

Error = 1000 − 940 = 60 gm.

Gain% = (60 ÷ 940) × 100 = 600 ÷ 94 = 6.3829...

Rounding to two decimal places, we get 6.38%.

Therefore The correct answer is 6.38%.

Alternate Method

Given: True Weight = 1 kg (1000 gm), Faulty Weight = 940 gm, Selling Price (SP) = Cost Price (CP) per unit weight.

Formulas: Profit = SP − CP | Profit% = (Profit ÷ CP) × 100

=> Let the cost of 1 gm be Re. 1. Then CP of 1000 gm = Rs. 1000.

=> Shopkeeper sells 940 gm for the price of 1000 gm (since he sells at CP but uses less weight).

=> Effective CP (for shopkeeper) = Rs. 940 | Effective SP = Rs. 1000.

=> Profit = 1000 − 940 = Rs. 60.

=> Profit% = (60 ÷ 940) × 100 ≈ 6.38%.

Therefore The correct answer is 6.38%.

Additional Information

Dishonest Dealer Concept

When a dealer claims to sell at cost price but uses false weights, the profit is calculated on the actual weight delivered to the customer.

Effective Ratio

Profit can also be found using the ratio of True Weight : False Weight, which represents the inverse ratio of costs and returns.

Q76. Answer: (a) 4.45

Shortcut Trick

Direct formula for Curved Surface Area (CSA) of a cylinder is 2πrh.

Radius r = CSA ÷ (2 × π × h)

r = 2800 ÷ (2 × 22/7 × 100) = 28 ÷ (44/7) = (28 × 7) ÷ 44

r = 196 ÷ 44 ≈ 4.4545...

Therefore The correct answer is 4.45 cm.

Alternate Method

Given:

Curved Surface Area (CSA) = 2800 cm^2

Length (h) = 100 cm

π = 22/7

Formula Used:

CSA of cylinder = 2πrh

Calculations:

=> 2800 = 2 × (22/7) × r × 100

=> 2800 = (4400/7) × r

=> r = (2800 × 7) ÷ 4400

=> r = (28 × 7) ÷ 44

=> r = 196 ÷ 44

=> r = 49 ÷ 11

=> r = 4.454545...

Rounding to two decimal places, we get r ≈ 4.45 cm.

Therefore The correct answer is 4.45 cm.

Additional Information

Total Surface Area of Cylinder

It includes the curved area plus the area of two circular bases: TSA = 2πr(h + r).

Volume of Cylinder

The space occupied by the cylinder: Volume = πr²h.

Hollow Cylinder CSA

For a pipe with thickness, the outer CSA is 2πRh and inner CSA is 2πrh.

Q77. Answer: (c) 2020

The correct answer is "2020".

Key Points

• The Minister of Finance, Ms. Nirmala Sitharaman, presented the Banking Regulation (Amendment) Bill, 2020, in the Lok Sabha on March 3, 2020.

• The Banking Regulation Act of 1949 is being modified by the bill to include cooperative banks.

• The Act sets rules for how banks operate and gives information on a number of different topics, including bank operations, management, and licensing.

• Therefore, the correct answer is "2020".

Additional Information

• The Act does not apply to all cooperative societies. These are:

1. Primary agricultural credit societies,

2. Cooperative land mortgage banks, and

3. Any other cooperative societies.

• According to the Bill, no one will be permitted to seek payment for the surrender of shares that a cooperative bank has issued to him. Furthermore, unless the RBI otherwise specifies, a cooperative bank is not permitted to withdraw or reduce its share capital.

Q78. Answer: (b) Pankaj Advani

The correct answer is 'Pankaj Advani'.

Key Points

• Pankaj Advani is an Indian Billiards player who has won 17 World Billiards titles.

• He has also won the International Billiards and Snooker Federation (IBSF) World Champion title 25 times.

• Pankaj Advani is the Indian cueist who won his eighth title at the 19th Asian 100 UP Billiards Championship 2022.

Additional Information

• The Indian cueist, Wilson Jones was the first Asian to win the World Billiards Championship title.

• Alok Kumar won the 2011 Asian Billiards Championship and was the runner-up of the 2013 World Billiards Championship.

• Dhruv Sitwala, an Indian cueist, won the Asian Billiards Championship twice in 2015 and 2016.

Q79. Answer: (a) J

Given → J, L, N, P, R, T, V and W are sitting around a square table facing the center of the table.

1) W is sitting immediately left of J but not an neighbour of P or R.

2) T is the immediate right of L.

Case 1:-

Case 2:-

3) N has R and T as his immediate neighbours.

Case 1:-

Case 2:-

4) V is an immediate neighbour of R.

Case 1:-

Case 2:-

5) P will be seated at the empty position.

Case 1:-

In case 1 the only psotition left for P is to the immediate left of W which is not possible as W is not the immediate neighbour of P or R.

Case 2:-

It can be clearly seen that J is sitting to the immediate left of P.

Hence, the correct answer is "J".

Q80. Answer: (a) 45

The logic followed here is:-

Hence, the correct answer is "45".

Q81. Answer: (b) HI → H2 + I2

The correct answer is HI → H2 + I2.

Key Points

• A combination reaction is a reaction in which two or more substances combine to form a single new substance.

• Combination reactions can also be called synthesis reactions.

• The general form of a combination reaction is A+B→AB. One combination reaction is two elements combining to form a compound.

• The given reaction is an example of a decomposition reaction because here one reactant breaks down into two or more products.

Q82. Answer: (c) C6H11

The correct answer is C6H11.

Key Points

• Homologous series

• Homologous series is a series of compounds with similar chemical properties and some functional groups differing from the successive member by CH2.

• Carbon chains of varying lengths have been observed in organic compounds having the same general formula.

• Such organic compounds that vary from one another by a repeating unit and have the same general formula form a series of compounds.

• Alkanes with the general formula CnH2n+2, alkenes with the general formula CnH2n, and alkynes with the general formula CnH2n-2 form the most basic homologous series in organic chemistry.

• The same thing can be observed in the case of alkenes in which the first member is ethene and the successive members are C3H6, C4H8, and C5H10.

• They differ from each other by a –CH2 unit. The Alkene formula is written as CnH2n.

Q83. Answer: (a) sunlight is polychromatic

The correct answer is sunlight is polychromatic.

Key Points

• The polychromatic light

• The polychromatic light source is a source that gives light of several wavelengths (hence several colors). White light is polychromatic because it is a combination of different wavelengths (violet, indigo, blue, green, yellow, orange, and red).

• Rainbow is caused due to the dispersion of sunlight from water drops.

• Some parts of the sunlight fall on water drops and then enter the water drops. Now the color components of the sunlight are dispersed and forming a rainbow.

• So when the sunlight falls on the water drop it enters the water drop due to the refraction phenomenon. So here the water drop acts as a prism. So when the white light passes through this prism, the white light is dispersed into its different component colors-orange, red, yellow, green, blue, and violet. This is known as the dispersion phenomenon. This phenomenon is caused by the change in the speed of light rays of different wavelengths.

• So it can say a rainbow is formed due to the dispersion of sunlight from water droplets and the refraction of sunlight into the water droplets.

Q84. Answer: (d) Nine

Given → A certain number of persons are standing in a straight row facing North.

• X is standing to the immediate left of W but immediate right of R.

• Z is standing to the immediate left of R.

• There is only one person to the left of P.

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• Only four persons are standing between P and Q.
• Q is standing to the immediate left of Y.
• The person standing at the extreme right end is the only person to the right of Y.
• The final arrangement after seating all the people.

From the above arrangement, it can be seen that nine people are standing in the row facing north.

Hence, the correct answer is "Nine".

Q85. Answer: (a) Only conclusions II and III follow

The least possible venn diagram for the given statements is:-

Conclusions:

I. Some figures are pictures → Doesn't follow (As it is given in the statement that all pictures are drawings and no drawing is caricature.)

II. No caricature is picture → Follows (As all pictures are drawings and no drawing is caricatures.)

III. No picture is figure → Follows (All pictures are drawings and all figures are caricatures.)

IV. Some caricatures are pictures → Doesn't follow (As all pictures are drawings and no drawing is caricature.)

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

Q86. Answer: (c) Rs. 12,850

Shortcut Trick

Profit Ratio of A, B and C = (10 × 5) : (12 × 6) : (15 × 9) = 50 : 72 : 135

Total profit in ratio parts = 50 + 72 + 135 = 257 parts

Given A's profit = 50 parts = Rs. 2500 => 1 part = Rs. 50

Total Profit = 257 parts = 257 × 50 = Rs. 12,850

Therefore The correct answer is Rs. 12,850.

Alternate Method

Given:

Investment of A = Rs. 10,000, Time = 5 months

Investment of B = Rs. 12,000, Time = 6 months

Investment of C = Rs. 15,000, Time = 9 months

A's profit share = Rs. 2,500

Formula Used:

Profit Ratio = Investment × Time

Calculations:

=> Profit ratio (A : B : C) = (10000 × 5) : (12000 × 6) : (15000 × 9)

=> Profit ratio = 50000 : 72000 : 135000 = 50 : 72 : 135

=> Let the profits of A, B, and C be 50x, 72x, and 135x respectively.

=> Total profit = 50x + 72x + 135x = 257x

=> Given A's profit = 50x = 2500

=> x = 2500 ÷ 50 = 50

=> Total Profit = 257x = 257 × 50 = 12850

Therefore The correct answer is Rs. 12,850.

Additional Information

Compound Partnership

When capitals of partners are invested for different time periods, the profit or loss is distributed in the ratio of the product of their capital and time.

Simple Partnership

When capitals of partners are invested for the same period of time, the profit or loss is distributed in the exact ratio of their original investments.

Working and Sleeping Partners

A working partner manages the business and receives a specific salary or percentage. A sleeping partner only invests capital. The remaining profit after salary deduction is shared in the investment ratio.

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Q87. Answer: (a) 190

Shortcut Trick

Ratio of numbers = 5 : 6 : 8

LCM of ratio units (5, 6, 8) = 120

120 units = 1200 => 1 unit = 10

Sum of numbers = (5 + 6 + 8) × 10 = 19 × 10 = 190

Therefore The correct answer is 190.

Alternate Method

Given: Ratio of three numbers = 5 : 6 : 8 and LCM = 1200.

Formula Used: Numbers can be written as ax, bx, cx where x is the HCF.

=> Let the numbers be 5x, 6x, and 8x.

=> LCM of (5, 6, 8) = 120

=> 120 × x = 1200

=> x = 1200 ÷ 120 = 10

=> First number = 5 × 10 = 50

=> Second number = 6 × 10 = 60

=> Third number = 8 × 10 = 80

=> Sum of numbers = 50 + 60 + 80 = 190

Therefore The correct answer is 190.

Additional Information

Relationship between HCF and LCM

For two numbers a and b, HCF(a, b) × LCM(a, b) = a × b. This property does not directly apply to three numbers.

HCF (Highest Common Factor)

HCF is the greatest number that divides each of the given numbers without leaving a remainder.

LCM (Least Common Multiple)

LCM is the smallest positive integer that is divisible by each of the given numbers.

Q88. Answer: (b) 18 years

Shortcut Trick

Sum of ages of husband and wife at marriage → 23 × 2 = 46 years.

Child born after 4 years of marriage (since child is 1 year old after 5 years).

Sum of ages when child was born → 46 + (4 × 2) + 0 = 54 years.

Average age of 3 members → 54 ÷ 3 = 18 years.

Therefore The correct answer is 18 years.

Alternate Method

Given: Average age of husband and wife = 23 years. Time passed = 5 years. Child age = 1 year.

Formula: Average = Sum of observations ÷ Number of observations

=> Sum of ages of husband and wife at marriage = 23 × 2 = 46 years.

=> At the end of 5 years, child is 1 year old, so child was born 1 year ago.

=> Time from marriage to child birth = 5 − 1 = 4 years.

=> Sum of ages of husband and wife when child was born = 46 + (4 × 2) = 54 years.

=> Total members in family at child birth = 2 (parents) + 1 (newborn) = 3.

=> Average age at child birth = (54 + 0) ÷ 3 = 18 years.

Therefore The correct answer is 18 years.

Additional Information

Average Age Increase

If every person in a group grows by n years, the average age of the group also increases by exactly n years.

New Member Inclusion

New Average = (Old Sum + New Member Age) ÷ (Old Number + 1). For a newborn, the age added is 0.

Weighted Average

When combining two groups, use (n1x1 + n2x2) ÷ (n1 + n2) to find the combined average.

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Q89. Answer: (d) ©TML©

Given → Number/Symbol and their codes:-

Number/Symbol	4	%	5	8	@	$	5	4	^	•	#	3	&	9
Code Letter	G	O	H	P	T	M	A	B	L	N	F	S	Q	R

Conditions for coding the group elements

S.no	Condition	Result
1	If the first element is a symbol and the last element is a number	The codes for these two (the first and the last elements) are to be interchanged.
2	If the first element is an odd number and the last element is an even number	The first and the last elements are to be coded as ©.
3	If both the second and the third elements are perfect squares	The third element is to be coded as the code for the second element.

In 5 @ $ ^ 8 :-

Condition 1: Doesn't follow → First element is not a symbol but a number and the last element is a number.

Condition 2: Follows → First element is an odd number and the last element is an even number. Therefore, both the first and last element are to be coded as ©.

Condition 3: Doesn't follow → The second element and the third element are symbols.

Thus, the code for 5 @ $ ^ 8 is:-

Number/Symbol	5	@	$	^	8
Code letter for Number/Symbol	©	T	M	L	©

Hence, the correct answer is "©TML©".

Q90. Answer: (a) paternal chromosome

The correct answer is Paternal chromosome.

Key Points

• The sex of an offspring is determined by the DNA of the male gamete.

• In the male, the sex chromosome is X Y and in the female sex, the chromosome is X X.

• In male gamete formation, half of the sperm contains an X chromosome and the other half contains Y chromosome.

• In female gamete contains only X chromosomes.

• When a male gamete chromosome fertilizes an ova, the zygote develops into a female.

• When a sperm carrying Y chromosomes fertilizes an egg, the zygote develops into a male.

Q91. Answer: (d) Beside N

Given:

• Six friends M, N, O, P, Q, and R are seated around a round table.

• P is an immediate neighbour of both N and R.

• Q is an immediate neighbour of both M and O.

• N is not seated on either side of O.

Therefore, the correct answer is 'Beside N'.

Q92. Answer: (b) 280

The correct answer is '280'.

Key Points

• The Finance Commission of India is a constitutionally mandated body established by the Indian President under the Article 280 of the Constitution of India in 1951.

• The commission was established to outline the financial ties between the state and the centre.

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• The terms, eligibility, and powers of the Finance Commission are outlined in the Finance Commission Act of 1951, along with the requirements for qualification, appointment, and disqualification.

• As per the Constitution, the Finance Commission is appointed every five years and consists of five members, a chairman and four other members.

Additional Information

• The taxes on professions, trades, callings, and employment are described in Article 276 of the Indian Constitution.

• Grants in lieu of export duty on jute and jute products are covered in Article 273 of the Indian Constitution, which also states that the Consolidated Fund of India shall be charged with such sums as may be prescribed each year as grants in aid of the revenues of the States of Assam, Bihar, Orissa, and West Bengal, in lieu of assignment of any share of the net proceeds of export duty on jute and jute products to those States.

• The exemption from state taxes of water or electricity in certain circumstances is covered by the Article 288 of the Constitution of India.

Q93. Answer: (b) 0.6

Given:

(0.064) + (0.008)/(0.16 + 0.04 - 0.08)

Calculation:

Let us simplify:

(0.064) + (0.008)/(0.16 + 0.04 - 0.08)

= (64 + 8)×10^(-3)/(16 + 4 - 8)10^(-2)

= (72)×10^(-3)/(12)×10^(-2)

= (72)×10^(-1)/(12)

= 6×10^(-1)

=0.6

The correct answer is 0.6.

Q94. Answer: (a) 4

The pattern followed here is even number should be preceded and followed by an odd number.

So

Thus, there are four such sets of letters found in which an even number is preceded by and followed by an odd number.

Hence, the correct answer is '4'.

Q95. Answer: (c) Newlands' law of octaves worked well with lighter elements only.

The correct answer is Newlands' law of octaves worked well with lighter elements only.

Key Points

• In 1866, John Newlands, an English scientist, arranged the then-known elements in the order of increasing atomic masses.

• He started with the element having the lowest atomic mass (hydrogen) and ended at thorium which was the 56th element.

• He found that every eighth element had properties similar to that of the first. He compared this to the octaves found in music.

• Therefore, he called it the ‘Law of Octaves’.

• According to the Newlands Octaves, the properties of Lithium and Sodium were found to be the same.

• The image shows a demonstration of the arrangement made by Newland.

Important Points

• There were the following limitations of the Newland's Law of Octaves

• It was found that the Law of Octaves was applicable only up to calcium, as after calcium every eighth element did not possess properties similar to that of the first.

• It was assumed by Newlands that only 56 elements existed in nature and no more elements would be discovered in the future. But, later on, several new elements were discovered, whose properties did not fit into the Law of Octaves.

• After the discovery of the Noble gases, the Law of Octaves became irrelevant. Thus, Newlands’ Law of Octaves worked well with lighter elements only.

Q96. Answer: (d) 2088/10989

Given:

0.696696... × 0.2727...

Calculation:

0.696696... =0.696696696...
let,
x= 0.696696... {equation (1)}
multiplying by 1000 both sides
1000x=696.696 {equation(2)}
substracting equation (1) from equation (2)
1000x-x = 696.696 - 0.696
999x = 696
x = 696over999
0.696696... = 696over999
let,
y = 0.2727... {equation (3)}
multiplying by 100 both sides
100y= 27.27 {equation (4)}
substracting equation (3) from equation (4)
100y - y = 27.27 - 0.27
99y = 27
y = 27over99
y= 3over11
0.696696... × 0.2727... = xy
= 696/999×3/11
= 2088/10989
The correct answer is " 2088over10989 ".

Q97. Answer: (c) Narendra Modi Stadium, Ahmedabad

The correct answer is 'Narendra Modi Stadium, Ahmedabad'.

Key Points

• The final match of the Indian Premier League (IPL) 2022 was played at the Narendra Modi Stadium, Ahmedabad.

• A record-breaking 101,566 fans watched the IPL 2022 final match, which earned it a place in the Guinness Book of World Records.

• In the Indian Premier League (IPL) 2022 final match, the title was won by the Gujarat Titans after defeating Rajasthan Royals.

Important Points

• Here is a look at various award winners after the final match in Ahmedabad:

IPL 2022 champions	Gujarat Titans
Fairplay award	Gujarat Titans and Rajasthan Royals
Emerging player of the season	Umran Malik
Super Striker of the season	Dinesh Karthik
Game changer of the season	Jos Buttler
Perfect Catch of the Season	Evin Lewis
Purple cap	Yuzvendra Chahal
Orange cap	Jos Buttler
Most Valuable Player	Jos Buttler
Super Striker of the Season	Jos Buttler

Additional Information

• The men's T20 franchise Indian cricket league is called the Indian Premier League (IPL).

• The game comprises of ten teams, each from a different city and state, competing in it every year.

• The Indian Premier League (IPL) was founded by the Board of Control for Cricket in India (BCCI) in 2007.

• IPL typically takes place in the months of March through May every year in India and has a special window in the ICC Future Tours Programme.

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Q98. Answer: (c) on the left-hand side of

The correct answer is on the left-hand side*.*

Key Points

• A chemical equation is the symbolic representation of a chemical reaction in the form of symbols and chemical formulas.

• In a chemical equation, the reactants are on the left side of the reaction arrow, and the products are on the right side.

• Reactant: A substance that undergoes a change in a chemical reaction and is written on the left side of the reaction arrow in a chemical equation.

Q99. Answer: (c) 26

Given expression:

5.18 × 4 + 2.06 × 5 - 10 ÷ 2 + 1 = ?

Concept used:

This question will be solved by using BODMAS rule.

Calculation:

5.18 × 4 + 2.06 × 5 - (10 ÷ 2) + 1

Taking approximation: 5 × 4 + 2 × 5 - 5 + 1

=> 20 + 10 - 5 + 1 = 26

The correct answer is 26.

Q100. Answer: (b) at C of a concave mirror

The correct answer is at C of a concave mirror.

Key Points

• A concave mirror has a reflective surface curved inward and away from the light source. Concave mirrors reflect light inward to one focal point.

• To get an image of the same size as the object in a concave mirror, the object should be placed at the center of the curvature of the mirror. The image formed is real and inverted.

• The ray diagram is

Additional Information

• Different positions of the object and their image by a concave mirror.

Position of the object(concave mirror)	Position of image	Size of the image in comparison to the object	Nature of image
At infinity	At focus	Highly diminished	Real inverted
Between infinity and the center of curvature	Between the focus and center of curvature	Diminished	Real inverted
At the center of curvature	At the center of curvature	of the same size	Real inverted
At focus	At infinity	Highly enlarged	Real, inverted
Between the focus and center of curvature	Between the center of curvature and infinity	Enlarged	Real inverted

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