RRB Group D Previous Year Paper (Held on: 2 Sept 2022 Shift 3)

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

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Practise under exam conditions, then review your answers after you submit.

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

CBT

Q1. 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.

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

13 : 195 : : 11 : 143 : : 7 : ?

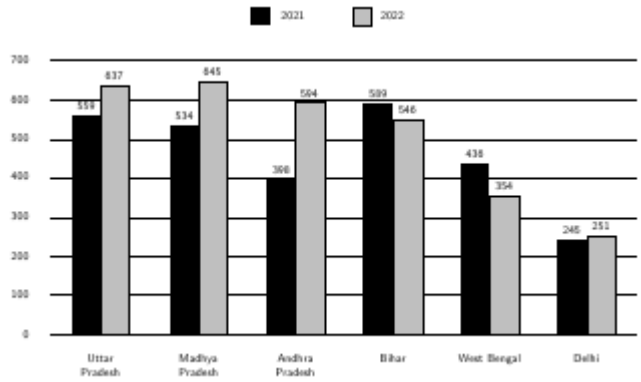
(a) 91
(b) 105
(c) 107
(d) 63

Q2. What is the natural resource from which petrol and diesel are obtained?

(a) Petroleum
(b) Coke
(c) Bitumen
(d) Coal tar

Q3. Study the given graph and answer the question that follows.

The graph presents the total production of crops (in metric tonnes) in six different states/UTs of the country in the years 2021 and 2022.



In which pair of states/UTs is the ratio of total crop production for both the years 1 : 2?

(a) Delhi and Uttar Pradesh
(b) West Bengal and Andhra Pradesh
(c) Delhi and Andhra Pradesh
(d) West Bengal and Madhya Pradesh

Q4. An object is placed at a distance of 40 cm from a convex lens having focal length 20 cm. Which option given below, correctly describes the nature and the relative size of the image formed in the respective order?

(a) Virtual, erect and diminished
(b) Real, inverted and same sized
(c) Virtual, erect and enlarged
(d) Real, inverted and diminished

Q5. AB is parallel to CD. A transversal PQ intersects AB and CD at E and F, respectively, and angle PEB = 78°. G is a point between AB and CD such that angle BEG = 18° and angle GFE = 30°. What is the measure of angle EGF?

(a) 68°
(b) 58°
(c) 66°
(d) 72°

Q6. For the equation $2x^2 + bx + 3 = 0$, the smaller root is 0.5. Find the value of b.

(a) -2
(b) -7
(c) 5
(d) 1

Q7. In a certain code language, '856 458 1265' means 'you are good', 568 235 1265 1452 means 'good boy bad habit', and '25475 458 568' means 'evils are bad'. In that language, which code stands for 'are'?

(a) 458
(b) 235
(c) 856
(d) 1265

Q8. Refer to the following letter series and answer the question that follows.

A F R C D S Y H N T E D C I D Q A C V Y U I N G R F S C W R

How many such consonants are there each of which is immediately preceded by a vowel and also immediately followed by a vowel?

(a) Zero
(b) One
(c) Two
(d) Three

Q9. A certain number of people are sitting in a row, facing north. B sits fourth to the right of E. C sits third to the right of B. A sits sixth to the left of E. There are only two persons between C and D. If no other person is sitting in the row, what is the total number of persons seated?

(a) 12
(b) 20
(c) 17
(d) 9

Q10. A 2200 W electric toaster operates at 220 V. The resistance of its coil is:

(a) 88 Ω
(b) 11 Ω
(c) 22 Ω
(d) 44 Ω

Q11. A boat takes 21 minutes to go 12.6 km upstream. The ratio of the speed of the boat in still water to that of the stream is 7 : 2. How much total time (in hours) will the boat take to go 43.2 km upstream and 38.88 km downstream?

(a) 1.6
(b) 2
(c) 1.8

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(d) 2.4

Q12. Who gave the laws of inheritance?

(a) Watson and Crick
(b) Carl Linnaeus
(c) Gregor Mendel
(d) Charles Darwin

Q13. If Rs. 12,500 amounts to Rs. 15,680 in 2 years at x% compound interest per annum, compounded annually, then the value of x is:

(a) 15
(b) 20
(c) 11
(d) 12

Q14. In March 2022, in which state did the World Health Organization sign an agreement with India to set up a Global Centre for Traditional Medicine?

(a) Himachal Pradesh
(b) Kerala
(c) Gujarat
(d) Rajasthan

Q15. By selling an article for Rs. 19.50, a man makes a profit of 30%. By how much should the sales price be increased to make a profit of 40%?

(a) Rs. 1.50
(b) Rs. 2.00
(c) Rs. 1.90
(d) Rs. 4

Q16. The HCF of the numbers 64, 86,108 and 260 is:

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

Q17. Which of the following wastes CANNOT be degraded by bacteria or other saprophytes?

(a) Leather
(b) Paper
(c) Excreta
(d) Plastic

Q18. If in a certain code language, CARBON is coded as DCUFTT and ENABLE is coded as FPDFQK, then how is CANDLE coded in that language?

(a) DCQHQK
(b) EDRIKQ
(c) EDRIQK
(d) DCHQKQ

Q19. How many resistors of 12 Ω must be connected in parallel combination to obtain 4 Ω resistance?

(a) 8 resistors
(b) 2 resistors
(c) 4 resistors
(d) 3 resistors

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Q20. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster.

PROFESS : ORPSSEF : : CONTAIN : NOCNIAT : ROUTINE : ?

(a) UROEINT
(b) TORENIU
(c) UORNETI
(d) UORENIT

Q21. How many prime numbers are there between 20 and 80?

(a) 15
(b) 13
(c) 16
(d) 14

Q22. Which of the following reactions is NOT an example of a displacement reaction?

(a) $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
(b) $Pb(s) + CuCl_2(aq) \rightarrow PbCl_2(aq) + Cu(s)$
(c) $2AgBr(s) \rightarrow$ (Sunlight) $2Ag(s) + Br_2(g)$
(d) $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$

Q23. What is the main role of the Reserve Bank of India?

(a) It maintains the profit generated by the banking sector.
(b) It provides fund to the private sector industries.
(c) It conducts consolidated supervision of the financial sector in India.
(d) It lends money to all people.

Q24. The volume of a cube whose side is 12 cm is:

(a) 1828 cm^3
(b) 1928 cm^3
(c) 1728 cm^3
(d) 1628 cm^3

Q25. The sayings or day-to-day teachings of Prophet Muhammad after his death were compiled by his followers and called _____.

(a) Hadith
(b) Sunnah
(c) Quran
(d) Sharia

Q26. 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.

13 : 28 : : 15 : 30 : : 20 : ?

(a) 35
(b) 36
(c) 40
(d) 42

Q27. A shopkeeper professes to sell his goods at a 10% loss but uses a false balance and gains 15%. The actual weight (correct to one decimal place) he uses for 1 kg is:

(a) 782.6 gm
(b) 784.4 gm
(c) 788.4 gm
(d) 785.6 gm

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Q28. Five times a number is 65. Find the number.

(a) 10
(b) 11
(c) 15
(d) 13

Q29. In the reaction $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$:

(a) MnO_2 is reduced to $MnCl_2$
(b) MnO_2 is oxidized to $MnCl_2$
(c) $MnCl_2$ is reduced to MnO_2
(d) Mn does not undergo redox reaction

Q30. The Resistance of a conductor is:

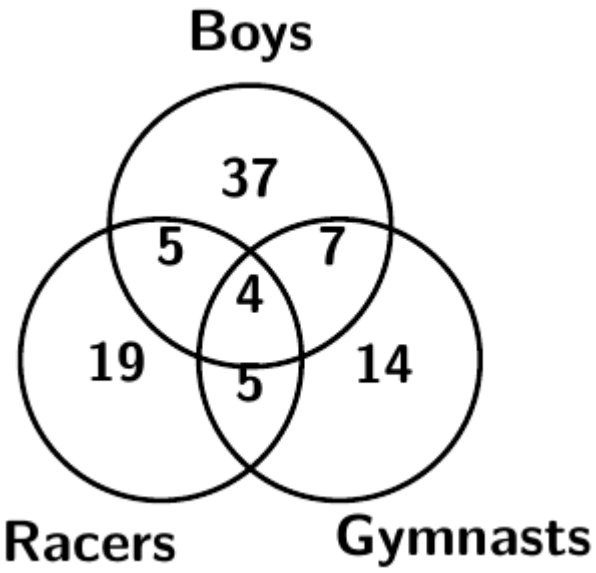
(a) The ratio of V and I
(b) The Difference of V and I
(c) The ratio of I and V
(d) The product of I and V

Q31. If a = 5, then $\sqrt{((4a^2 - 4a + 1))} + 6a$ is:

(a) 69
(b) 49
(c) 39
(d) 59

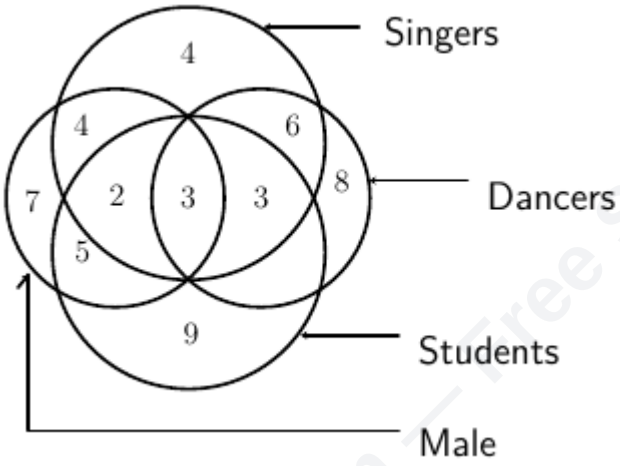
Q32. Study the given diagram carefully and answer the questions. The numbers in different sections indicate the number of persons.

In the following Venn diagram, the how many boys are there who are racers and gymnasts?



(a) 7
(b) 14
(c) 5
(d) 4

Q33. Study the Venn Diagram given below and answer the question that follows.



How many male students are neither singers nor dancers?

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

Q34. The part of the northern plains of India comprising older alluvium is known as:

(a) Khadar
(b) Bhabar
(c) Terai
(d) Bhangar

Q35. A certain number of people are sitting in a row and all are facing north. Exactly one person is sitting between G and K. I is sitting third to the right of J. H is sitting to the immediate right of G. Exactly four persons are sitting between I and K. M is sitting at the second position to the left of K. If it is given that there is no other person sitting in the row, what is the total number of people in the row?

(a) 12
(b) 13
(c) 10
(d) 11

Q36. A solid metallic cuboid of sides 4 cm × 10 cm × 15 cm is melted and made into small identical dices of 2 cm × 2 cm × 2 cm. How many such dices can be made?

(a) 36
(b) 40
(c) 75
(d) 43

Q37. Two coils, A and B, such that A is connected to a battery through a key and a rheostat, and B is connected to a galvanometer, are arranged parallel and close to each other. In which of the following durations, as described, is/are current(s) induced in B?

(a) 0 to 50 s: the current in A is steady

(b) 50 to 60 s: the current in A is decreased at a constant rate

(a) Only (b)
(b) Both (a) and (b)
(c) Only (a)
(d) Neither (a) nor (b)

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Q38. The annual income of Ram is Rs. 5,62,400. He spent 20% of this income on house rent, 15% of the remaining income on food, and 30% of the income still remaining with him on children's education. If the amount still remaining was his savings, which of the following amounts is closest to his actual savings?

(a) Rs. 2,67,703
(b) Rs. 2,67,730
(c) Rs. 2,76,703
(d) Rs. 2,67,037

Q39. Which one of the following districts in Western India recorded a temperature of 1.1 degrees Celcius on December 18, 2021?

(a) Churu
(b) Banswara
(c) Morbi
(d) Patan

Q40. The mean of the first 7 odd prime numbers is:

(a) 10.71
(b) 8.61
(c) 7.91
(d) 5.41

Q41. If 2 is added to each odd digit and 2 is subtracted from each even digit in the number 485136785, what will be the difference between the digits which are second from the left and third from the right?

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

Q42. When baking soda is heated it converts into _____, water, and carbon dioxide.

(a) sodium hydroxide
(b) sodium acetate
(c) sodium chloride
(d) sodium carbonate

Q43. Refer to the following letter and symbol series and answer the question.

(Left) E # R & H & @ J & M N # B & V & & D # P @ W % & Q & A % & # E & (Right)

If all the symbols are dropped from the series, which of the following will be third from the left?

(a) M
(b) Q
(c) H
(d) J

Q44. If the mean of the following data is 22, then what is the value of x?

Class	0-10	10-20	20-30	30-40	40-50
Frequency	12	16	6	7	x

(a) 9
(b) 6
(c) 13
(d) 19

Q45. Refer to the following letter, number, symbol series and answer the question.

(Left) N 3 F P # 1 C B 5 $ L Q 6 & N 8 D @ K 9 R (Right)

How many such symbols are there which are immediately preceded by a letter and also immediately followed by a number?

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

Q46. The 74th Constitutional Amendment Act provides for _____ for a transitional area between a rural and urban area.
(a) Gram Panchayat
(b) Nagar Panchayat
(c) Municipal Corporation
(d) Municipal Council

Q47. In July 2022, the Supreme Court of India gave an order giving more power to the right to be forgotten, which has been acknowledged as a facet of the right to privacy by the top court in its 2017 landmark judgment, the new order is related to _____.
(a) print media
(b) search engines and internet
(c) medical history
(d) phone calls

Q48. Red and Yellow soils can easily be found in parts of ____ and ____.
(a) Manipur and Sikkim
(b) Rajasthan and Gujarat
(c) Jammu and Kashmir and Ladakh
(d) Odisha and Chhattisgarh

Q49. The centre of curvature of a convex mirror is located at +18 cm, as per New Cartesian Sign convention. Its focus is at
(a) -9 cm
(b) -18 cm
(c) 16 cm
(d) 9 cm

Q50. There are 88 mobile phones, each of separate brands, arranged in a straight row at a mobile centre. The K brand mobile is 47^(th) from the left side of the row and the M brand mobile is 34^(th) from the right side of the row. How many mobile phones are between K and M brands?
(a) 8
(b) 7
(c) 9
(d) 10

Q51. The Women's Day week to raise awareness on 'Safety and Security of Women' was celebrated from _____ in 2022.
(a) 7^(th) to 14^(th) March
(b) 10^(th) to 17^(th) March
(c) 4^(th) to 11^(th) March
(d) 1^(st) to 8^(th) March

Q52. The value of √74529 is:
(a) 239
(b) 259
(c) 243
(d) 273

Q53. Let 0° < θ < 90°. √fracsec²θ + cosec²θ tan²θ - sin²θ × ((1 + tan²θ) sin²θ)/((cosec θ - cot θ)(1 + cos θ)) is equal to:
(a) cot² θ
(b) sin² θ cos²θ
(c) cosec²θ sec²θ

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(d) $\sec^2\theta$

Q54. Under the 'Talent Search and Development' component of 'Khelo India' programme to carry out talent identification, the country has been divided into how many zones as of July 2022?

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

Q55. Given below is a statement followed by two possible conclusions I and II. Read the information carefully and select the correct option.

Statement:

Country B has been importing 80% of its crude oil and petroleum from country Y for a few decades now to fulfil their fuel needs. However, owing to the current financial crisis in country Y, it exports the crude oil and petroleum to other countries at 30% higher prices now.

Which of the following can be concluded from the given information?

I. The car resale industry in country B will be on verge of a total shut down in the coming months.

II. Country B will increase fuel tax by 30%.

(a) Neither I nor II can be concluded from the given information.
(b) Only I can be concluded from the given information.
(c) Both I and II can be concluded from the given information.
(d) Only II can be concluded from the given information.

Q56. A quadratic equation whose roots are - 2/3 and - 3/2.

(a) $6x^2 - 13x - 1 = 0$
(b) $6x^2 + 13x + 6 = 0$
(c) $6x^2 - 13x + 6 = 0$
(d) $6x^2 + 13x + 1 = 0$

Q57. Which two signs should be interchanged to make the following equation correct?

$13 + 6 \div 12 - 4 \times 5 = 4$

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

Q58. Which of the following is a classical language among the 22 languages in the 8th Schedule of the Indian Constitution?

(a) Sanskrit
(b) Konkani
(c) Bengali
(d) Santhali

Q59. Which of the following is NOT a metal?

(a) Pb
(b) Sc
(c) Ga
(d) Si

Q60. An element X combines with chlorine to form a compound XCI. The element X is placed on the left side of the periodic table. Which of the following statements are correct for element X

i) Has one valance electron

ii) Is a metal and is solid

iii) Is a non-metal and is a gas

iv) Have five valance electron

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

Q61. Six classmates L, M, N, O, P and Q compare the IGCSE results of their final exam. Each of them scored different marks. O scored more than N but less than L. M scored more than N. P scored less than N but more than Q. L scored less than M. Who among the six scored the most?

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

Q62. Select the number from among the given options that can replace the question mark (?) in the following series.

188, 187, 183, 174, 158, ?

(a) 129
(b) 137
(c) 133
(d) 139

Q63. On which national festival is the National Flag of India hoisted by the Prime Minister at the Red Fort in old Delhi?

(a) National Constitution Day
(b) Independence Day
(c) Gandhi Jayanti
(d) Republic Day

Q64. Pipe P can fill 3/4 part of a tank in 18 hours and pipe Q can fill 3/5 part of the same tank in 12 hours. Both P and Q were kept open for 4 hours, then both were closed. Pipe R alone was then opened and it emptied the water in the tank in 51/2 hours. Pipes P, Q and R together can fill the empty tank in:

(a) 30 hours
(b) 36 hours
(c) 35 hours
(d) 40 hours

Q65. Sharad walks 4 km towards the west and then turns right and walks 5 km. Again, he turns left and walks 7 km. Finally, he turns to his left and walks 5 km. How far is he from the starting point?

(All turns are 90 degree turns only)

(a) 11 km
(b) 10 km
(c) 21 km
(d) 14 km

Q66. How many teams were scheduled to be a part of the 15^(th) edition of the Indian Premier League (Cricket), 2022?

(a) 12
(b) 10
(c) 15
(d) 17

Q67. Which of the following molecules govern the inheritance of a trait by the offspring?

(a) Only maternal DNA
(b) Paternal and maternal DNA
(c) Proteins
(d) Only paternal DNA

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Q68. In a quadrilateral ABCD, angle A = 86° and angle B = 72°. The bisectors of angle C and angle D meet at O. What is the measure of angle DOC?

(a) 91°
(b) 69°
(c) 101°
(d) 79°

Q69. If each of the digits in the number 417593286 is arranged in ascending order from left to right, the position of how many digits will remain unchanged as compared to that in the original number?

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

Q70. If 3.2 : x :: x : 16.2, and x > 0, then find the value of x.

(a) 9.7
(b) 5.4
(c) 6.3
(d) 7.2

Q71. Select the term from among the given options that can replace the question mark (?) in the following alpha-numeric series to make it logically complete.

3Z6, 8Y12, 15X18, 24W24, 35V30, ?

(a) 36U48
(b) 48V36
(c) 36V48
(d) 48U36

Q72. Three statements are followed by three conclusions numbered I, II and III. You have to consider these statements to be true, even if they seem to be at variance with commonly known facts. Decide which of the given conclusions logically follow(s) from the given statement.

Statements:

Some woods are charcoals

Some petrol is diesel

All diesel are fossils

Conclusions :

(I) Some petrol are charcoals

(II) Some fossils are petrol

(III) Some woods are diesel

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

Q73. Amongst six friends P, Q, R, S, T and U, each has a different height. R is taller than only three other friends. T is taller than only one friend. Q is taller than T but shorter than U. U is shorter than P. Who is the second tallest among all the friends?

(a) U
(b) P
(c) Q
(d) R

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Q74. Which of the following features of the Constitution of India is borrowed from the Constitution of Ireland?

(a) Single citizenship
(b) Rule of law
(c) Parliamentary system of government
(d) Directive principles of state policy

Q75. How many such pairs of letters are there in the word LOVABLE (in both forward and backward directions) which have as many letters between them in the word as there are in the English alphabetical order?

(a) 1
(b) 5
(c) 3
(d) 6

Q76. Match the following:

	Compound		Name
i.	C6H6	a.	Ethane
ii.	H2C = CH2	b.	Benzene
iii.	CH3 - CHO	c.	Acetaldehyde
iv.	CH3COCH3	d.	Ethylene
v.	CH3CH3	e.	Acetone

(a) i - d, ii - c, iii - a, iv - b, v - e
(b) i - b, ii - d, iii - c, iv - e, v - a
(c) i - d, ii - c, iii - e, iv - b, v - a
(d) i - a, ii - b, iii - c, iv - e, v - d

Q77. Study the following line graph and answer the question.

Export from 3 companies over the years
(in Rs. crore)



	2011	2012	2013	2014	2015	2016	2017
Company A	21.2	23.2	24.6	28.7	31.8	30.4	48.6
Company B	22.6	32.1	30.6	34.5	32.4	38.6	45.3
Company C	21.9	29.4	37.8	33.2	34.2	47.3	42.4

The average annual exports during the given period for Company B is what percentage of the average annual exports for Company C?

(a) 96.65%
(b) 93.99%
(c) 97.32%
(d) 95.90%

Q78. Which instrument aids in the detection of the heartbeat?

(a) Spirometer
(b) Thermometer
(c) Stethoscope
(d) Sphygmomanometer

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Q79. If ((15x - 9))/x + ((15y - 9))/y + ((15z - 9))/z = 0, then the value of 1/x + 1/y + 1/z is :

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

Q80. Which of the following is an indigenously developed automatic train protection system tested in India in March 2022?

(a) SANRAKSHAN
(b) KAVACH
(c) BACHAAV
(d) RAKSHAA

Q81. _____, the then largest NBFC - MFI got merged with IndusInd bank in July 2019.

(a) Annapurna Finance Private Limited
(b) CreditAccess Grameen Limited
(c) Bharat Financial Inclusion Limited
(d) Bandhan Financial Services Limited

Q82. In which of the following situations will there be no potential difference induced in the coil?

(a) A bar magnet moving towards a stationary coil
(b) A coil moving towards a stationary bar magnet
(c) A coil and a bar magnet moving in the same direction with the same speed
(d) A coil and a bar magnet moving towards each other with the same speed

(a) (c)
(b) (d)
(c) (a)
(d) (b)

Q83. Catenation property is shown by _____.

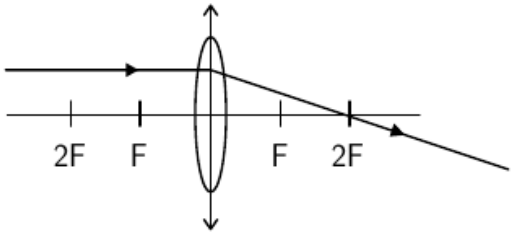
(a) Helium
(b) carbon
(c) Nitrogen
(d) Oxygen

Q84. In the process of storing and transferring ADP into ATP molecules, which of the following minerals is critical?

(a) Phosphorus
(b) Calcium
(c) Iron
(d) Sodium

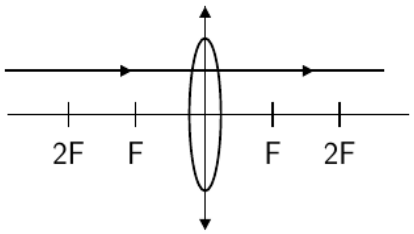
Q85. Which of the following diagrams correctly represents the path of a light ray incident parallel to the principal axis after refraction through the lens?

(a)

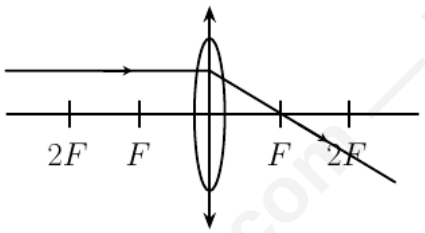


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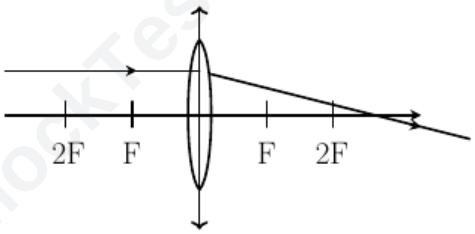
(b)



(c)



(d)



Q86. A, B, C, D, W, X, Y and Z are sitting around a square table facing the centre of the table. Some of them are sitting at the corners, while some are sitting at the middle of the sides. C sits third to the left of W. C sits at one of the corners. A does not sit at any of the corners. Y sits second to the right of A. A is not an immediate neighbour of C. Only three people sit between B and D. B is an immediate neighbour of Z. B does not sit at any of the middle of the sides.

Who sits second to the left of Y?

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

Q87. Suman's present age is twice that of Venkat's. Venkat's age, after 12 years, will be 21 years. Find Suman's present age.

(a) 16 years
(b) 18 years
(c) 22 years
(d) 20 years

Q88. _____ is a type of crescent-shaped sand dune formed in desert regions where the wind direction is very constant.

(a) Barchan
(b) Bluff
(c) Bergschrund
(d) Blowhole

Q89. A large tanker can be filled by pipes A and B in 60 minutes and 30 minutes, respectively. How much time will it take to fill the empty tanker, if for half the time pipe B is opened and for the remaining time pipes A and B are opened?

(a) 24 minutes
(b) 15 minutes
(c) 28 minutes
(d) 20 minutes

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Q90. Bone is an example of which of the following types of tissues?

(a) Connective tissue
(b) Muscular tissue
(c) Epithelial tissue
(d) Nervous tissue

Q91. Name the process by which soluble products of photosynthesis are transported to other parts of the plant.

(a) Diffusion
(b) Translocation
(c) Osmosis
(d) Transpiration

Q92. Pinky walked 160 m towards north, then she turned right and walks 240 m. Then she turned right and walked 280 m, then she turned left and walked 120 m. Finally, she turned left and walked 120 m. In which direction and how many metres is she from the starting position?

(All turns are 90 degree turns only)

(a) West, 120 m
(b) West, 360 m
(c) East, 120 m
(d) East, 360 m

Q93. The sum of the present ages of a father and his son is 6 years more than 3 times the present age of the son. After 2 years, 2 times the father's age will be 7 years less than 5 times the son's age. The difference (in years) between the ages of the father and the son is:

(a) 17
(b) 19
(c) 20
(d) 23

Q94. Select the number from among the given options that can replace the question mark (?) in the following series.

10, 132, 234, 318, ?, 440.

(a) 386
(b) 373
(c) 369
(d) 332

Q95. A ray of light is incident on a concave mirror at point M. The ray makes an angle of 10° with a line joining M to the centre of curvature. The ray is reflected at an angle of _____.

(a) 20°
(b) 10°
(c) 30°
(d) 40°

Q96. Which of the following is NOT an alkali?

(a) Ba(OH)2
(b) NH4OH
(c) Cu(OH)2
(d) LiOH

Q97. Six friends, A, B, C, D, E and F, are sitting in a circle facing the centre of the circle. A is 2^(nd) to the right of E. Only one person sits between F and D. B and D are immediate neighbours. F is 3^(rd) to the right of B. C is second to the right of D. Who sits between D and F?

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

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(d) B

Q98. Which of the following statements about the Rajya Sabha is correct?

(a) One-third of the members retire every year.
(b) One-third of the members retire every second year.
(c) Half of the members retire every year.
(d) One-fifth of the members retire every second year.

Q99. Who was the Viceroy of British India when the Rowlatt Act was passed?

(a) Lord Canning
(b) Lord Reading
(c) Lord Chelmsford
(d) Lord Curzon

Q100. In India, Petrol price was liberalized and deregulated in June:

(a) 2014
(b) 2017
(c) 2010
(d) 2008

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (d) 63

The logic follows here is as,

Second number = First number x (First number +2)

Hence, '63' is the correct answer.

Q2. Answer: (a) Petroleum

The correct answer is 'Petroleum'.

Key Points

• Petroleum is a natural resource.

• Petrol and diesel are obtained from a natural resource called petroleum.

• The word petroleum is derived from petra (rock) and oleum (oil) as it is mined from between the rocks under Earth.

Additional Information

• Coke: It is a grey, hard, and porous coal-based fuel with a high carbon content and few impurities, made by heating coal or oil in the absence of air, a destructive distillation process.

• Bitumen: It is a substance produced through the distillation of crude oil. Bitumen is known for its waterproofing and adhesive properties and is commonly used in the construction industry, notably for roads and highways.

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• Coal Tar: It is a thick dark liquid that is a by-production of coke and coal gas from coal.

Q3. Answer: (c) Delhi and Andhra Pradesh

Given:

Concept used:

Count total crop production for both the years for each state. Calculate ratio for answer.

Calculation:

Total production of crops in Uttar Pradesh in the years 2021 and 2022 = 559 + 637 = 1196

Total production of crops in Madhya Pradesh in the years 2021 and 2022 = 534 + 645 = 1179

Total production of crops in Andhra Pradesh in the years 2021 and 2022 = 398 + 594 = 992

Total production of crops in Bihar in the years 2021 and 2022 = 589 + 546 = 1135

Total production of crops in West Bengal in the years 2021 and 2022 = 436 + 354 = 790

Total production of crops in Delhi in the years 2021 and 2022 = 245 + 251 = 496

Now calculate Ratios,

Option 1: Ratio of total crop production for both the years of Delhi and Uttar Pradesh = 496/1196= 31/74

Option 2: Ratio of total crop production for both the years of West Bengal and Andhra Pradesh = 790/992=395/496

Option 3: Ratio of total crop production for both the years of Delhi and Andhra Pradesh = 496/992=1/2

Option 4: Ratio of total crop production for both the years of West Bengal and Madhya Pradesh = 790/1179

Here, Delhi and Andhra Pradesh pair of states/UTs is the ratio of total crop production for both the years 1 : 2.

Hence, 'option 3' is the correct answer.

Q4. Answer: (b) Real, inverted and same sized

Given:

Object distance u=-40 cm

Focal length f=20 cm

Formula Used:

The Lens formula is given by

1/v-1/u=1/f [Here v is the image distance]

Calculation:

Now putting the values

1/v=1/f+1/u; Rightarrow 1/v=1/20+1/(-40)=1/20-1/40; Rightarrow 1/v=(2-1)/40=1/40; Rightarrow v=40 cm

Magnification

m=v/u=(40)/(-40)=-1

Hence the image will be real,inverted and of same size.

Q5. Answer: (c) 66°

Shortcut Trick

Since AB || CD, the angle angle BEF and angle PEB are supplementary (linear pair).

angle BEF = 180° − angle PEB = 180° − 78° = 102°.

The angle angle GEF is the difference between angle BEF and angle BEG: angle GEF = 102° − 18° = 84°.

In ΔEGF, the sum of angles is 180°: angle EGF = 180° − (angle GEF + angle GFE).

angle EGF = 180° − (84° + 30°) = 180° − 114° = 66°.

Therefore The correct answer is 66°.

Alternate Method

Given:

Line AB || CD, transversal PQ intersects them at E and F.

angle PEB = 78°, angle BEG = 18°, and angle GFE = 30°.

Formula Used:

1. Linear Pair Axiom: Sum of angles on a straight line is 180°.

2. Angle Sum Property: Sum of interior angles of a triangle is 180°.

Calculations:

=> Since PQ is a straight line, angle PEB + angle BEF = 180°

=> 78° + angle BEF = 180°

=> angle BEF = 180° − 78° = 102°

=> Given angle BEG = 18°, we find angle GEF = angle BEF − angle BEG

=> angle GEF = 102° − 18° = 84°

=> In ΔEGF, the sum of angles is 180°:

=> angle GEF + angle GFE + angle EGF = 180°

=> 84° + 30° + angle EGF = 180°

=> 114° + angle EGF = 180°

=> angle EGF = 180° − 114° = 66°

Therefore The correct answer is 66°.

Additional Information

Parallel Lines and Transversals

When a transversal intersects two parallel lines, alternate interior angles are equal, and consecutive interior angles are supplementary (sum to 180°).

Angle Sum Property of a Triangle

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

Linear Pair of Angles

Angles that lie on a straight line and share a common vertex and side always add up to 180°.

Q6. Answer: (b) -7

Shortcut Trick

A root of a quadratic equation must satisfy the equation when substituted for x.

Substitute x = 0.5 in $2x^2 + bx + 3 = 0$:

$2(0.5)^2 + b(0.5) + 3 = 0$

$0.5 + 0.5b + 3 = 0 \Rightarrow 0.5b = -3.5 \Rightarrow b = -7$

Therefore The correct answer is -7.

Alternate Method

Given:

Equation: $2x^2 + bx + 3 = 0$

Smaller root (x1) = 0.5

Formula Used:

For a quadratic equation $ax^2 + bx + c = 0$:

Product of roots (x1 × x2) = c ÷ a

Sum of roots (x1 + x2) = −b ÷ a

Calculations:

=> 0.5 × x2 = 3 ÷ 2

=> 0.5 × x2 = 1.5

=> x2 = 1.5 ÷ 0.5 = 3

=> x1 + x2 = −b ÷ 2

=> 0.5 + 3 = −b ÷ 2

=> 3.5 = −b ÷ 2

=> 3.5 × 2 = −b

=> 7 = −b

=> b = −7

Therefore The correct answer is -7.

Additional Information

Nature of Roots

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

Quadratic Formula

The roots of $ax^2 + bx + c = 0$ can be found using $x = (-b \pm \sqrt{(b^2 - 4ac)}) \div 2a$.

Vieta's Formulas

For any polynomial, the sum of roots is always −(coefficient of second highest power) ÷ (leading coefficient).

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Q7. Answer: (a) 458

The code for each word is shown below:

The code for 'are' is 458.

Hence, ‘458’ is the correct answer.

Q8. Answer: (a) Zero

The logic follows here is:

• Vowel → Consonant → Vowel

A F R C D S Y H N T E D C I D Q A C V Y U I N G R F S C W R

Here, no consonants are there each of which is immediately preceded by a vowel and also immediately followed by a vowel.

Hence, 'option 1' is the correct answer.

Q9. Answer: (c) 17

Given:

A certain number of people are sitting in a row, facing north.

Solution:

(1) B sits fourth to the right of E.

(2) C sits third to the right of B.

(3) A sits sixth to the left of E.

(4) There are only two persons between C and D.

Here is 17 persons seated.

Hence, 'option 3' is the correct answer.

Q10. Answer: (c) 22 Ω

Given:

Power of toaster P=2200 W.

Voltage of toaster V=220 V

Formula Used:

The resistance of the electric $R=(V^2)/P$

Calculation:

The resistance of the toaster $=((220)^2)/2200$; =22 ohm

The resistance of the toaster 22 ohm.

Q11. Answer: (c) 1.8

Shortcut Trick

Upstream speed = 12.6 km ÷ (21/60) hr = 36 kmph.

Ratio of Boat speed (u) to Stream speed (v) = 7 : 2.

Upstream speed (u − v) = 7 − 2 = 5 units = 36 kmph => 1 unit = 7.2 kmph.

Downstream speed (u + v) = 7 + 2 = 9 units = 9 × 7.2 = 64.8 kmph.

Total time = (43.2 ÷ 36) + (38.88 ÷ 64.8) = 1.2 + 0.6 = 1.8 hours.

Therefore The correct answer is 1.8 hours.

Alternate Method

Given: Upstream distance = 12.6 km, Time = 21 min, Speed ratio Boat : Stream = 7 : 2.

Formula Used: Speed = Distance ÷ Time; Downstream speed = u + v; Upstream speed = u − v.

=> Upstream speed = 12.6 / (21/60) = (12.6 × 60) / 21

=> Upstream speed = 0.6 × 60 = 36 kmph.

=> Let Boat speed (u) = 7x and Stream speed (v) = 2x.

=> u − v = 7x − 2x = 5x = 36 => x = 7.2.

=> Downstream speed = 7x + 2x = 9x = 9 × 7.2 = 64.8 kmph.

=> Time for 43.2 km Upstream = 43.2 / 36 = 1.2 hours.

=> Time for 38.88 km Downstream = 38.88 / 64.8 = 0.6 hours.

=> Total Time = 1.2 + 0.6 = 1.8 hours.

Therefore The correct answer is 1.8 hours.

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Additional Information

Upstream and Downstream Logic

Downstream speed (D) = Speed in still water (u) + Speed of stream (v). Upstream speed (U) = u − v.

Speed in Still Water

The speed of the boat in still water can be calculated as u = (D + U) / 2.

Speed of Stream

The speed of the water current or stream can be calculated as v = (D − U) / 2.

Q12. Answer: (c) Gregor Mendel

The correct answer is 'Gregor Mendel'.

Key Points

• Gregor Mendel, through his work on pea plants, discovered the fundamental laws of inheritance.

• He deduced that genes come in pairs and are inherited as distinct units, one from each parent.

• Mendel tracked the segregation of parental genes and their appearance in the offspring as dominant or recessive traits.

• Mendel's law of inheritance are as follows:

• Law of segregation: During gamete formation, the alleles for each gene segregate from each other so that each gamete carries only one allele for each gene.

• Law of independent assortment: Genes for different traits can segregate independently during the formation of gametes.

Additional Information

• Watson and Crick discovered the double helix ,the twisted ladder structure of DNA(Deoxyribonucleic acid)

• Carl Linnaeus is famous for the invention of the naming system of plants and animal.

• Charles Darwin is famous for the theory of natural selection.

Q13. Answer: (d) 12

Shortcut Trick

Ratio of Amount (A) to Principal (P) = 15680 : 12500 = 784 : 625

Since the time period is 2 years, take the square root of the ratio parts.

Square root ratio = √784 : √625 = 28 : 25

Rate x = [(28 − 25) ÷ 25] × 100 = (3 ÷ 25) × 100 = 12%

Therefore The correct answer is 12.

Alternate Method

Given:

Principal (P) = Rs. 12,500

Amount (A) = Rs. 15,680

Time (n) = 2 years

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

Calculations:

=> $15680 = 12500 \times (1 + x/100)^2$

=> $15680 \div 12500 = (1 + x/100)^2$

=> $1568 \div 1250 = (1 + x/100)^2$

=> $784 \div 625 = (1 + x/100)^2$

=> $(28 \div 25)^2 = (1 + x/100)^2$

=> $28 \div 25 = 1 + x/100$

=> $x/100 = (28 \div 25) - 1$

=> $x/100 = 3 \div 25$

=> $x = (3 \times 100) \div 25$

=> $x = 12$

Therefore The correct answer is 12.

Additional Information

Compound Interest Formula

The amount A is calculated as $A = P(1 + r/100)^n$, where P is principal, r is rate per annum, and n is time in years.

Effective Rate for 2 Years

The effective compound interest rate for two years can be found using the successive change formula: x + x + (x × x)/100.

CI and SI Difference

For a period of 2 years, the difference between Compound Interest and Simple Interest is given by $D = P(r/100)^2$.

Q14. Answer: (c) Gujarat

The correct answer is 'Gujrat'.

Key Points

• The first of its kind World Health Organization Global center for Traditional Medicine in Jamnagar, Gujrat.

• This centre will be set up at the Institute of Training and Research in Ayurveda in Gujrat.

• The primary objective of GCTM is to harness the potential of traditional medicine from across the world.

• It will be established under the Ministry of AYUSH.

Q15. Answer: (a) Rs. 1.50

Shortcut Trick

Current Selling Price (SP1) = 130% of Cost Price (CP) = Rs. 19.50.

New Selling Price (SP2) required = 140% of CP.

Using ratio-unitary method: 130 units = 19.50 => 1 unit = 19.50 ÷ 130 = 0.15.

Required increase in price = (140% − 130%) = 10% of CP.

Required increase = 10 × 0.15 = Rs. 1.50.

Therefore The correct answer is Rs. 1.50.

Alternate Method

Given: SP1 = Rs. 19.50, Profit1% = 30%, Profit2% = 40%.

Formulas: CP = SP × 100 ÷ (100 + P%), SP = CP × (100 + P%) ÷ 100.

=> Cost Price (CP) = 19.50 × 100 ÷ 130 = Rs. 15.

=> New Selling Price (SP2) = 15 × 140 ÷ 100 = Rs. 21.

=> Increase in Sales Price = SP2 − SP1 = 21 − 19.50 = Rs. 1.50.

Therefore The correct answer is Rs. 1.50.

Additional Information

Direct SP Ratio

When CP is constant, the ratio of Selling Prices is equal to the ratio of (100 + Profit%). SP1 : SP2 = (100 + P1) : (100 + P2).

Cost Price

The base price on which profit or loss is always calculated unless specified otherwise. CP = 100% of itself.

Q16. Answer: (b) 2

Shortcut Trick

The HCF (Highest Common Factor) cannot be greater than the smallest difference between any two numbers.

Difference between 86 and 64 = 86 − 64 = 22.

Difference between 108 and 86 = 108 − 86 = 22.

The HCF must be a factor of 22 (1, 2, 11, 22). Checking options, only 2 divides all given numbers.

Therefore The correct answer is 2.

Alternate Method

Given Numbers: 64, 86, 108, 260

Method: Prime Factorisation

=> 64 = 2 × 2 × 2 × 2 × 2 × 2 = 2^6

=> 86 = 2 × 43 = $2^1 \times 43^1$

=> 108 = 2 × 2 × 3 × 3 × 3 = $2^2 \times 3^3$

=> 260 = 2 × 2 × 5 × 13 = $2^2 \times 5^1 \times 13^1$

=> HCF = Product of the lowest power of common prime factors

=> HCF = $2^1 = 2$

Therefore The correct answer is 2.

Additional Information

HCF (Highest Common Factor)

The greatest number that divides two or more numbers without leaving a remainder. Also known as GCD (Greatest Common

Divisor).

Relation between HCF and LCM

For two numbers A and B: HCF(A, B) × LCM(A, B) = A × B.

HCF of Fractions

HCF of Fractions = (HCF of Numerators) ÷ (LCM of Denominators).

Q17. Answer: (d) Plastic

The correct answer is 'Plastic'.

Key Points

• Non-biodegradable waste: Those materials which cannot be broken down or decomposed into the soil by micro-organisms and natural agents are labeled as non-biodegradable.

• These substances consist of plastic materials, metal scraps, aluminum cans and bottles, etc.

• Plastic can not be decomposed by bacteria.

Additional Information Biodegradable Waste can be defined as the waste which can be broke by the microorganism. The example of this waste are food waste, paper waste and green waste.

Q18. Answer: (a) DCQHQK

The logic follows here is as,

Similarly,

Hence, 'option 1' is the correct answer.

Q19. Answer: (d) 3 resistors

Given:

Value of resistors is = 12 Ω.

Formula Used:

Equivalent resistance in parallel combination

1/R_e=n/R [Where n is the number of resistors]

Calculation:

Now it can be written as

1/4=n/12; Rightarrow n=12 × 1/4; Rightarrow n=3 Ω

Hence the numbers of resistors connected is '3'.

Q20. Answer: (d) UORENIT

The logic follows here is:

Similarly,

Hence, 'option 4' is the correct answer.

Q21. Answer: (d) 14

Shortcut Trick

Use the standard count of prime numbers in ranges: 1 to 50 has 15, and 51 to 100 has 10.

Between 20 and 80, the primes are: 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79.

Total count = 14.

Therefore The correct answer is 14.

Alternate Method

Given: Range between 20 and 80.

List all prime numbers (numbers with exactly two factors: 1 and itself) in the specified range:

=> Primes in 20s: 23, 29 (2 numbers)

=> Primes in 30s: 31, 37 (2 numbers)

=> Primes in 40s: 41, 43, 47 (3 numbers)

=> Primes in 50s: 53, 59 (2 numbers)

=> Primes in 60s: 61, 67 (2 numbers)

=> Primes in 70s: 71, 73, 79 (3 numbers)

=> Total Count = 2 + 2 + 3 + 2 + 2 + 3 = 14

Therefore The correct answer is 14.

Additional Information

Prime Number Definition

A natural number greater than 1 that has no positive divisors other than 1 and itself. 2 is the only even prime number.

Prime Counts (1-100)

There are exactly 25 prime numbers between 1 and 100.

Co-prime Numbers

Two numbers are co-prime if their Highest Common Factor (HCF) is 1.

Q22. Answer: (c) 2AgBr(s) → (Sunlight) 2Ag(s) + Br2(g)

The correct answer is '2AgBr(s) → (Sunlight) 2Ag(s) + Br2(g)'.

Key Points

• A displacement reaction is the one wherein the atom or a set of atoms is displaced by another atom in a molecule.

• For instance, when iron is added to a copper sulphate solution, it displaces the copper metal.

• A + B-C → A-C + B.

• The above equation exists when A is more reactive than B.

Additional Information

• The displacement reaction is the one whether the atom or group of atom are displaced by the atom or group of atoms.

• The starting materials are always pure elements, such as a pure zinc metal or hydrogen gas, plus an aqueous compound.

Q23. Answer: (c) It conducts consolidated supervision of the financial sector in India.

The correct answer is 'It conducts consolidated supervision of the financial sector in India.'.

Key Points

• The Reserve Bank of India was established on April 1, 1935 in accordance with the provisions of the Reserve Bank of India Act, 1934.

• It is India's central bank and regulatory body responsible for the regulation of the Indian Banking system.

• It conducts consolidated supervision of the financial sector in India.

Additional Information

• The Banking Regulation Act, 1949 empowers the Reserve Bank of India to inspect and supervise commercial banks.

• The Reserve Bank of India Act, 1934 requires the Central Government to entrust the reserve bank with all its money, remittance, exchange and banking transactions in India and the management of its public debt.

Q24. Answer: (c) 1728 cm^3

Shortcut Trick

Volume of a cube = $(side)^3$

Given side = 12 cm

Volume = $12^3 = 12 \times 12 \times 12 = 1728\ cm^3$

Therefore The correct answer is 1728 cm^3.

Alternate Method

Given:

Side of the cube (a) = 12 cm

Formula used:

Volume (V) = a^3

Calculations:

=> Volume = 12 × 12 × 12

=> Volume = 144 × 12

=> Volume = 1728 cm^3

Therefore The correct answer is 1728 cm^3.

Additional Information

Total Surface Area of Cube

The total surface area (TSA) of a cube is calculated as $6a^2$, where 'a' is the side length.

Diagonal of a Cube

The longest diagonal of a cube is given by the formula $d = a\sqrt{3}$.

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Lateral Surface Area

The lateral surface area (LSA) which excludes the top and bottom faces is $4a^2$.

Q25. Answer: (a) Hadith

The correct answer is 'Hadith'.

Key Points

• Hadith refers to the belief of the words, actions, and silent approval of the Islamic prophet Muhammad.

• It is transmitted reports attributed to what Muhammad said and did.

• It is called as the Backbone of Islamic civilization.

• Many authority takes Hadith as a source for religious law and moral guidance ranks second only to that of the Quran.

Q26. Answer: (a) 35

The logic follows here is as,

Hence, '35' is the correct answer.

Q27. Answer: (a) 782.6 gm

Shortcut Trick

Let the Cost Price (CP) of 1000 gm be 1000 units.

Selling at 10% loss => Selling Price (SP) = 1000 − 10% of 1000 = 900 units.

Overall Gain is 15%, so SP = CP × (115 ÷ 100).

900 = (Actual Weight Used) × 1.15.

Actual Weight = 900 ÷ 1.15 = 782.608... gm.

Therefore The correct answer is 782.6 gm.

Alternate Method

Given → Loss% = 10%, Profit% = 15%, True Weight = 1000 gm.

Formulas: Gain% = [(True Weight − Actual Weight) ÷ Actual Weight] × 100 | Net Effect = Successive multiplication of ratios.

=> Let the actual weight used be 'x' gm.

=> Effective CP for the shopkeeper = x units.

=> Effective SP for the shopkeeper = 1000 × (100 − 10) ÷ 100 = 900 units.

=> According to the question: 15 = [(900 − x) ÷ x] × 100.

=> 15x = 90000 − 100x.

=> 115x = 90000 => x = 90000 ÷ 115.

=> x = 782.608... ≈ 782.6 gm.

Therefore The correct answer is 782.6 gm.

Additional Information

Dishonest Dealer Concept

When a dealer sells goods at CP but uses less weight, Gain% = [Error ÷ (True Value − Error)] × 100.

Net Profit with Weight and Price Manipulation

Final Multiplier = (Weight Ratio) × (Price Ratio). Here, (1000 ÷ x) × (90 ÷ 100) = 115 ÷ 100.

Q28. Answer: (d) 13

Shortcut Trick

Directly divide the given total by the multiplier.

Value = 65 ÷ 5

Value = 13

Therefore The correct answer is 13.

Alternate Method

Given:

Five times a number is 65.

Calculations:

Let the required number be x.

=> 5 × x = 65

=> x = 65 ÷ 5

=> x = 13

Therefore The correct answer is 13.

Additional Information

Linear Equations

An equation involving only one variable with a power of 1 is called a linear equation in one variable.

Inverse Operations

Division is the inverse operation of multiplication. To isolate the variable in 5x = 65, we divide by the coefficient 5.

Transposition Method

Moving a term from one side of the equation to another involves changing its sign or operation (multiplication becomes division).

Q29. Answer: (a) MnO2 is reduced to MnCl2

The correct answer is 'MnO2 is reduced to MnCl2'.

Key Points

• A REDOX reaction is where oxidation and reduction occur simultaneously in a reaction.

• The reaction in which oxygen is either gained or hydrogen is lost by a substance is called oxidation reaction.The reaction in which hydrogen is gained or oxygen is lost by a substance is called reduction reaction.

• A substance is oxidised when: It gains Oxygen.

• It loses Hydrogen.

Q30. Answer: (a) The ratio of V and I

The correct answer is 'The ratio of V and I'.

Key Points

• Conductor resistance is a property of a conductor at a specific temperature.

• it is defined as the amount of opposition there is to the flow of electric current through a conducting medium.

• Ohm's law states that the current through a conductor between two points is directly proportional to the voltage across the two points. Therefore, V = RI where R is a constant called resistance.

• R depends on the dimensions of the conductor and also on the material of the conductor.

Q31. Answer: (c) 39

Shortcut Trick

Directly substitute a = 5 into the given expression.

=> $\sqrt{(4 \times 5^2 - 4 \times 5 + 1)} + 6 \times 5$

=> $\sqrt{(100 - 20 + 1)} + 30$

=> $\sqrt{81} + 30 = 9 + 30 = 39$

Therefore The correct answer is 39.

Alternate Method

Given:

Expression: $\sqrt{(4a^2 - 4a + 1)} + 6a$

Value of a = 5

Formula Used:

$(x - y)^2 = x^2 - 2xy + y^2$

Calculations:

We can simplify the algebraic expression inside the square root first by expressing it as a perfect square.

=> $4a^2 - 4a + 1 = (2a)^2 - 2(2a)(1) + (1)^2$

=> $4a^2 - 4a + 1 = (2a - 1)^2$

Now substitute this squared term back into the original expression:

=> $\sqrt{((2a - 1)^2)} + 6a$

=> $(2a - 1) + 6a$

=> $8a - 1$

Now, substitute the given value a = 5 into the simplified expression:

=> $8 \times 5 - 1$

=> $40 - 1 = 39$

Therefore The correct answer is 39.

Additional Information

Algebraic Identities

Important perfect square identities frequently used in simplification are $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$.

Square Root of Perfect Squares

The square root of a squared number is mathematically its absolute value: $\sqrt{x^2} = |x|$. Since $2a - 1$ is positive for $a = 5$, we can directly evaluate it as $2a - 1$ without negative signs.

BODMAS Rule

When directly substituting numeric values into an equation, operations must follow the standard sequence: Brackets, Orders (Powers/Roots), Division, Multiplication, Addition, and Subtraction.

Q32. Answer: (d) 4

The shaded part represents boys are there who are racers and gymnasts:

The number representing boys are there who are racers and gymnasts = 4

Hence, '4' is the correct answer.

Q33. Answer: (c) 5

The shaded part represents male students are neither singers nor dancers.

The number representing male students are neither singers nor dancers = 5

Hence, '5' is the correct answer.

Q34. Answer: (d) Bhangar

The correct answer is 'Bhangar'.

Key Points

• Bhangar is older alluvial soil which represents the upland alluvial tract.

• The soil is rich in humus and it gives a high yield due to rich amount of minerals and humus in the soil.

• It comprises calcium carbonate nodules called 'Kankars' which are impure in nature.

• These soils are coarser in texture.

Additional Information

• Khadar - This is the new soil formed due to alluvial deposits along the course of the river, The land slit comprises silt, mud, clay, and sand and are finer in nature.

• Bhabar - The rivers, after descending from the mountains deposits pebbles in a narrow belt of about 8 to 16 km in width lying parallel to the slopes of Shiwaliks forming Bhabar.

• Terai - South of bhabar belt, the streams and rivers re-emerge and create a wet, swampy, and marshy region known as Terai. Dudhwa National Park lies in this region.

Q35. Answer: (a) 12

Given :

A certain number of people are sitting in a row and all are facing north.

Solution:

(1) Exactly one person is sitting between G and K.

(2) H is sitting to the immediate right of G.

(3) M is sitting at the second position to the left of K.

• It is possible only in case 1.

(4) Exactly four persons are sitting between I and K.

(5) I is sitting third to the right of J.

• It is possible in case 2.

Here is 12 peoples in the row.

Hence, 'option 1' is the correct answer.

Q36. Answer: (c) 75

Shortcut Trick

Number of dices = Volume of large cuboid ÷ Volume of one small dice

Number = (4 × 10 × 15) ÷ (2 × 2 × 2)

Number = 600 ÷ 8 = 75

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Therefore The correct answer is 75 dices.

Alternate Method

Given:

Dimensions of metallic cuboid: Length (L) = 15 cm, Breadth (B) = 10 cm, Height (H) = 4 cm.

Dimensions of small dice (cube): Side (a) = 2 cm.

Formula Used:

Volume of cuboid = L × B × H

Volume of cube = a^3

Calculations:

=> Total Volume of cuboid = 4 × 10 × 15 = 600 cm^3

=> Volume of one dice = 2 × 2 × 2 = 8 cm^3

=> Number of dices = Total Volume ÷ Volume of one dice

=> Number = 600 ÷ 8

=> Number = 75

Therefore The correct answer is 75 dices.

Additional Information

Conservation of Volume

When a solid is melted and recast into other shapes, the total volume remains constant.

Surface Area of Cuboid

The Total Surface Area (TSA) of a cuboid is given by 2(LB + BH + HL).

Cube Properties

For a cube of side 'a', the Volume is a^3 and the Diagonal is $a\sqrt{3}$.

Q37. Answer: (a) Only (b)

The correct answer is 'Only (b)'.

Key Points

• When two circular coils A and B are placed close to each other, and the current in the coil A is changed then some current will be induced in the coil B and the magnetic field associated with it also changes.

• Thus the magnetic field around coil B also changes. This change in the magnetic field lines around coil B induces an electric current in it. This process is known as electromagnetic induction.

Q38. Answer: (a) Rs. 2,67,703

Shortcut Trick

Successive Remaining method: Savings = Income × (100−r1)% × (100−r2)% × (100−r3)%

Savings = 5,62,400 × 80% × 85% × 70%

Savings = 5,62,400 × 0.8 × 0.85 × 0.7 = 5,62,400 × 0.476

Savings = 2,67,702.4

Therefore The correct answer is Rs. 2,67,703.

Alternate Method

Given: Annual Income = Rs. 5,62,400, Rent = 20%, Food = 15% (remaining), Education = 30% (remaining).

=> Step 1: Income after House Rent = 5,62,400 × (100 − 20)% = 5,62,400 × 0.80 = Rs. 4,49,920

=> Step 2: Income after Food = 4,49,920 × (100 − 15)% = 4,49,920 × 0.85 = Rs. 3,82,432

=> Step 3: Final Savings = 3,82,432 × (100 − 30)% = 3,82,432 × 0.70 = Rs. 2,67,702.4

=> Final value: Approximating to the nearest whole number ≈ Rs. 2,67,703

Therefore The correct answer is Rs. 2,67,703.

Additional Information

Successive Percentage Change

When values are reduced from the remaining balance, use the multiplying factor method: Final = Initial × (1−r1/100) × (1−r2/100)...

Effective Percentage Decrease

Two successive decreases of a% and b% result in a total decrease of (a + b − ab/100)%.

Base Value Rule

Always ensure whether the percentage is calculated on the original income or the remaining income to avoid calculation errors.

Q39. Answer: (a) Churu

The correct answer is 'Churu'.

Key Points

• Churu, a district in Rajasthan, is known for its abrupt temperatures over the years.

• It is located close to the Thar desert, one of the hottest regions of India.

• It recorded 1.1 degrees Celcius on Saturday, December 18, 2021.

• The Lowest temperature recorded in Churu is -2.5 degrees Celcius.

Q40. Answer: (a) 10.71

Shortcut Trick

The first 7 odd prime numbers are 3, 5, 7, 11, 13, 17, and 19.

Sum = 3 + 5 + 7 + 11 + 13 + 17 + 19 = 75

Mean = Sum ÷ Count

=> Mean = 75 ÷ 7 = 10.714...

Therefore The correct answer is 10.71.

Alternate Method

Given:

We need to find the mean of the first 7 odd prime numbers.

Formula Used:

Mean = (Sum of observations) ÷ (Number of observations)

First 7 Odd Prime Numbers

3

5

7

11

13

17

19

Sum = 75

Mean = 75 ÷ 7 ≈ 10.71

Calculations:

=> A prime number has exactly two factors: 1 and itself.

=> 2 is the only even prime number, so odd primes start from the number 3.

=> The first 7 odd prime numbers are: 3, 5, 7, 11, 13, 17, and 19.

=> Total number of observations = 7

=> Sum of observations = 3 + 5 + 7 + 11 + 13 + 17 + 19

=> Sum of observations = 75

=> Mean = 75 ÷ 7

=> Mean ≈ 10.714...

Therefore The correct answer is 10.71.

Additional Information

Prime Numbers

A natural number greater than 1 with exactly two distinct factors: 1 and itself. Example: 2, 3, 5, 7, 11.

Even vs Odd Primes

The number 2 is the only even prime number. Every other prime number is odd.

Averages (Mean)

The arithmetic mean is defined as the sum of all values divided by the total count of values.

Q41. Answer: (d) 3

Given:

If 2 is added to each odd digit and 2 is subtracted from each even digit in the number 485136785:

Second from the left is 6 and third from the right is 9 = 9 - 6 = 3

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The difference between the digits which are second from the left and third from the right is '3'.

Q42. Answer: (d) sodium carbonate

The correct answer is 'sodium carbonate'.

Key Points

• When baking powder is heated or mixed in water, CO2 gas is produced.

• When baking powder is heated or mixed with water it evolves carbon dioxide gas which gets converted into sodium carbonate.

• The chemical reaction is as followed NaHCO3 → Na2 CO3+CO2+H2 O.

• When sodium hydrogen carbonate is dissolved in water, it slightly gets hydrolyzed.

Q43. Answer: (c) H

Given:

letter and symbol series:

(Left) E # R & H & @ J & M N # B & V & & D # P @ W % & Q & A % & # E & (Right)

If all the symbols are dropped from the series:

Then, third from the left is H.

The correct answer is 'H'.

Q44. Answer: (a) 9

Shortcut Trick

Find mid-points: 5, 15, 25, 35, 45.

Total frequency ∑f = 41 + x.

Sum of (Frequency × Mid-point) = 60 + 240 + 150 + 245 + 45x = 695 + 45x.

Apply Mean formula: 22 × (41 + x) = 695 + 45x => 902 + 22x = 695 + 45x => 207 = 23x.

Therefore The correct answer is 9.

Alternate Method

Given:

Mean (&bar;x) = 22

Class Intervals and Frequencies (f): 0-10 (12), 10-20 (16), 20-30 (6), 30-40 (7), 40-50 (x)

Formula Used:

Arithmetic Mean (&bar;x) = ∑f_ix_i / ∑f_i, where x_i is the class mark (mid-value).

Calculations:

=> Sum of frequencies (∑f_i) = 12 + 16 + 6 + 7 + x = 41 + x

=> Sum of product (∑f_ix_i) = (12 × 5) + (16 × 15) + (6 × 25) + (7 × 35) + (x × 45)

=> ∑f_ix_i = 60 + 240 + 150 + 245 + 45x = 695 + 45x

=> Mean = ∑f_ix_i / ∑f_i

=> 22 = (695 + 45x) / (41 + x)

=> 22 × (41 + x) = 695 + 45x

=> 902 + 22x = 695 + 45x

=> 902 − 695 = 45x − 22x

=> 207 = 23x

=> x = 207 ÷ 23

=> x = 9

Therefore The correct answer is 9.

Additional Information

Assumed Mean Method

It simplifies calculation for large data: &bar;x = A + (∑f_id_i / ∑f_i), where A is the assumed mean and d_i = x_i − A.

Empirical Relationship

The relationship between the three measures of central tendency is: 3 Median = Mode + 2 Mean.

Class Mark

The class mark of a class interval is the average of its upper and lower limits: (Upper Limit + Lower Limit) ÷ 2.

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Q45. Answer: (c) 1

Given:

letter, number, symbol series:

(Left) N 3 F P # 1 C B 5 $ L Q 6 & N 8 D @ K 9 R (Right)

symbols are there which are immediately preceded by a letter and also immediately followed by a number:

Letter → Symbols → Number

The correct answer is '1'.

Q46. Answer: (b) Nagar Panchayat

The correct answer is 'Nagar Panchayat'.

Key Points

• The 74th Amendment Act of 1992 provides for the constitution of the following three types of municipalities in every state:

1. Nagar Panchayat - For Transitional area, i.e., an area in transition from a rural area to an urban area.

2. Municipal Council- For smaller urban areas, as specified by state legislation.

3. Municipal Corporation- For larger urban area that is an area of population of more than 1 million.

Additional Information

74th Amendment Act of 1992:

• This act added a new Part IX-A- 'The Municipalities' to the constitution of India.

• The new part consists of provisions from Articles 243-P to 243-ZG.

• The Act also added a new Twelfth Schedule to the constitution.

• This Schedule contains 18 functional items of municipalities and deal with Article 243-W.

Q47. Answer: (b) search engines and internet

The correct answer is 'Search engines and internet'.

Key Points

• The right to be forgotten allows a person to seek deletion of private information from the internet.

• It has been acknowledged by the Supreme Court in its 2017 landmark judgement as a facet of the right to privacy.

Q48. Answer: (d) Odisha and Chhattisgarh

The correct answer is 'Odisha and Chhattisgarh'.

Key Points

• Red and Yellow soils can be easily found in the parts of Odisha, Chhattisgarh, Maharashtra, Southern Karnataka, Tamil Nadu, Madhya Pradesh, and Rajasthan.

• Due to higher degree of hydration of ferric oxide the soil acquired yellow color.

• Red color is due to the diffusion of iron in crystalline and metamorphic rocks.

• The pH of this type of soil ranges between 5.5 to 8.5.

Q49. Answer: (d) 9 cm

The correct answer is 9 cm.

Key Points

• The New Cartesian Sign Convention has several rules:

• The object is always placed to the left of the mirror.

• This means all distances measured to the right of the mirror (along + x-axis) are taken as positive, while those measured to the left are taken as negative.

• The heights measured upwards and perpendicular to the principal axis are taken as positive.

• Those measured downwards are taken as negative.

• For a spherical mirror (convex or concave), the radius of curvature (R) is twice the focal length (f).

• This is expressed in the mirror formula as R = 2f.

• Given that the centre of curvature (which equals the radius of curvature) of a convex mirror is located at +18 cm, the focal length would be half of this.

• However, because the mirror is convex, the focus is virtual and is found on the same side as the light being reflected.

• According to the New Cartesian Sign Convention, this side of the mirror is the negative side.

• So, the focus of the mirror would be at 9 cm.

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Q50. Answer: (b) 7

Given:

There are 88 mobile phones, each of separate brands, arranged in a straight row at a mobile centre.

\

The K brand mobile is 47th from the left side of the row and the M brand mobile is 34th from the right side of the row.

→ 47^(th)= 47

→34^(th) = 54

Then, 54 -47 = 7

Mobile phones are between K and M brands are '7'.

Q51. Answer: (d) 1^(st) to 8^(th) March

The correct answer is '1st to 8th March'.

Key Points

• International Women's Day is celebrated on 8th March every year.

• It was officially announced by the United Nations in 1977.

• It is one of the important days of the year:

1. Celebrate women's achievements.
2. Raise awareness about women's equality.
3. Celebrate tech women and innovation.
4. Applaud equality for women in sports.
5. Educate women on health choice decisions.
6. Forge women's empowerment worldwide.

Additional Information

• There are three colors that symbolize International Women's Day.

1. Purple signifies justice and dignity.
2. Green symbolizes hope.
3. White represents purity.

• The colors originated from the Women's Social and Political Union (WSPU) in the UK in 1908.

Q52. Answer: (d) 273

Shortcut Trick

Identify the last digit: 9. The square root must end in 3 or 7.

Group the digits: 745 | 29. Find the nearest square smaller than 745.

272 = 729 and 282 = 784. Since 729 < 745, the first two digits are 27.

Possible answers are 273 or 277. Since 745 is closer to 729 than 784, the answer is the smaller one.

Therefore The correct answer is 273.

Alternate Method

Given: Number = 74529

Formula Used: Long Division Method for Square Root

=> Step 1: Pair digits from right to left: 7, 45, 29.

=> Step 2: 22 = 4. 7 − 4 = 3. Bring down 45. New dividend = 345.

=> Step 3: Double 2 to get 4. Find x such that 4x × x ≤ 345. Let x = 7.

=> Step 4: 47 × 7 = 329. 345 − 329 = 16. Bring down 29. New dividend = 1629.

=> Step 5: Double 27 to get 54. Find y such that 54y × y = 1629. Let y = 3.

=> Step 6: 543 × 3 = 1629. Remainder is 0.

Therefore The correct answer is 273.

Additional Information

Unit Digit Property

If a perfect square ends in 9, its square root must end in either 3 or 7 because 32 = 9 and 72 = 49.

Range Estimation

To estimate, check 2002 = 40,000 and 3002 = 90,000. The result must lie between 200 and 300.

Digital Sum Test

Digital sum of 74529 is 7+4+5+2+9 = 27 → 9. Digital sum of 273 is 12 → 3. Since 32 = 9, the answer is consistent.

Q53. Answer: (c) $\text{cosec}^2\theta \sec^2\theta$

Shortcut Trick

Put θ = 45° to find the value of the expression directly.

First term: $\sqrt{[(\sec^2 45° + \text{cosec}^2 45°) \div (\tan^2 45° - \sin^2 45°)]} = \sqrt{[(2 + 2) \div (1 - 1/2)]} = \sqrt{[4 \div (1/2)]} = \sqrt{8} = 2\sqrt{2}$

Second term: $[(1 + \tan^2 45°) \sin^2 45°] \div [(\text{cosec } 45° - \cot 45°)(1 + \cos 45°)] = [2 \times (1/2)] \div [(\sqrt{2} - 1)(1 + 1/\sqrt{2})] = 1 \div [(\sqrt{2} - 1)(\sqrt{2} + 1)/\sqrt{2}] = 1 \div [(2 - 1)/\sqrt{2}] = \sqrt{2}$

Multiplying both terms: $2\sqrt{2} \times \sqrt{2} = 4$

Checking options for θ = 45°: $\text{cosec}^2 45° \sec^2 45° = 2 \times 2 = 4$

Therefore The correct answer is $\text{cosec}^2\theta \sec^2\theta$.

Alternate Method

Given:

The trigonometric expression is: $\sqrt{\text{fracsec}^2\theta + \text{cosec}^2\theta \tan^2\theta - \sin^2\theta \times ((1 + \tan^2\theta) \sin^2\theta)/((\text{cosec } \theta - \cot \theta)(1 + \cos \theta))}$

Formula Used:

1. $\sec^2\theta + \text{cosec}^2\theta = \sec^2\theta \text{ cosec}^2\theta$

2. $\tan^2\theta - \sin^2\theta = \tan^2\theta \sin^2\theta$

3. $1 + \tan^2\theta = \sec^2\theta$

4. $\text{cosec } \theta - \cot \theta = (1 - \cos \theta) \div \sin \theta$

Calculations:

=> Simplify the term inside the square root:

=> $\text{Num} = \sec^2\theta + \text{cosec}^2\theta = 1/\cos^2\theta + 1/\sin^2\theta = (\sin^2\theta + \cos^2\theta)/(\sin^2\theta \cos^2\theta) = 1/(\sin^2\theta \cos^2\theta) = \sec^2\theta \text{ cosec}^2\theta$

=> $\text{Den} = \tan^2\theta - \sin^2\theta = \sin^2\theta/\cos^2\theta - \sin^2\theta = \sin^2\theta (1/\cos^2\theta - 1) = \sin^2\theta \tan^2\theta$

=> Square root term = $\sqrt{[(\sec^2\theta \text{ cosec}^2\theta) \div (\sin^2\theta \tan^2\theta)]} = (\sec \theta \text{ cosec } \theta) \div (\sin \theta \tan \theta) = [(1/\cos \theta)(1/\sin \theta)] \div [\sin \theta (\sin \theta/\cos \theta)] = 1/(\sin^3\theta)$

=> Simplify the second term:

=> $\text{Num} = (1 + \tan^2\theta) \sin^2\theta = \sec^2\theta \sin^2\theta = \sin^2\theta/\cos^2\theta = \tan^2\theta$

=> $\text{Den} = (\text{cosec } \theta - \cot \theta)(1 + \cos \theta) = [(1 - \cos \theta)/\sin \theta] \times (1 + \cos \theta) = (1 - \cos^2\theta)/\sin \theta = \sin^2\theta/\sin \theta = \sin \theta$

=> Second term = $\tan^2\theta \div \sin \theta = \sin^2\theta/(\cos^2\theta \sin \theta) = \sin \theta/\cos^2\theta$

=> Multiplying both simplified terms:

=> Result = $[1/(\sin^3\theta)] \times [\sin \theta/\cos^2\theta] = 1/(\sin^2\theta \cos^2\theta) = \text{cosec}^2\theta \sec^2\theta$

Therefore The correct answer is $\text{cosec}^2\theta \sec^2\theta$.

Additional Information

Trigonometric Identity for Sum and Product

The sum of squares of secant and cosecant is equal to their product: $\sec^2\theta + \text{cosec}^2\theta = \sec^2\theta \text{ cosec}^2\theta$.

Trigonometric Identity for Difference and Product

The difference of squares of tangent and sine is equal to their product: $\tan^2\theta - \sin^2\theta = \tan^2\theta \sin^2\theta$.

Reciprocal Conjugate Property

$\text{cosec } \theta - \cot \theta$ is the reciprocal of $\text{cosec } \theta + \cot \theta$, which helps simplify rational expressions containing trigonometric ratios.

Q54. Answer: (c) Five

The correct answer is 'Five'.

Key Points

• To carry out talent identification, the country has been divided into five zones.

• The five zones are namely, North, East, West, South, and North-East Zones.

Additional Information

• The 'Khelo India' programme has been introduced to revive the sports culture in India at the grass-root level by building a strong framework for all sports played in our country and establishing India as a great sporting nation.

• It was launched by PM Narendra Modi on 27 February 2019, at the Youth Indian Parliament in Vigyan Bhawan, New Delhi

• The 'Khelo India' programme consists of 12 components.

• Among them is the 'Talent search and Development'.

Q55. Answer: (a) Neither I nor II can be concluded from the given information.

Statement: Country B has been importing 80% of its crude oil and petroleum from country Y for a few decades now to fulfil their fuel needs. However, owing to the current financial crisis in country Y, it exports the crude oil and petroleum to other countries at 30% higher prices now.

Conclusion I: The car resale industry in country B will be on verge of a total shut down in the coming months - False

(This is not the permanent solution, As, Country B has been importing 80% of its crude oil and petroleum from country Y for a few decades now to fulfil their fuel needs. So, it will not shut down in the coming months and also not mentioned in the statement)

So, Conclusion I does not follow.

Conclusion II: Country B will increase fuel tax by 30% - False

(This is not the permanent solution, As, it exports the crude oil and petroleum to other countries at 30% higher prices now as mentioned in the statement).

So, Conclusion II does not follow.

Thus, 'Neither I nor II can be concluded from the given information'.

Q56. Answer: (b) $6x^2 + 13x + 6 = 0$

Shortcut Trick

Sum of roots (S) = −2/3 + (−3/2) = −13/6

Product of roots (P) = (−2/3) × (−3/2) = 1

For roots of the form −a/b and −b/a, the quadratic equation is (ab)x2 + (a2 + b2)x + (ab) = 0.

Substituting a = 2, b = 3: (2×3)x2 + (22 + 32)x + (2×3) = 0 => 6x2 + 13x + 6 = 0.

Therefore The correct answer is 6x2 + 13x + 6 = 0.

Alternate Method

Given:

First root (α) = −2/3

Second root (β) = −3/2

Formula Used:

A quadratic equation with roots α and β is given by: x2 − (α + β)x + αβ = 0

Calculations:

=> Sum of roots (α + β) = (−2/3) + (−3/2)

=> Sum = (−4 − 9) ÷ 6 = −13/6

=> Product of roots (αβ) = (−2/3) × (−3/2) = 6/6 = 1

=> The required equation is: x2 − (−13/6)x + 1 = 0

=> x2 + (13/6)x + 1 = 0

=> 6x2 + 13x + 6 = 0

Therefore The correct answer is 6x2 + 13x + 6 = 0.

Additional Information

Relationship between Roots and Coefficients

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

Nature of Roots

The nature is determined by the Discriminant (D) = b2 − 4ac. If D > 0, roots are real and distinct; if D = 0, roots are real and equal; if D < 0, roots are imaginary.

Quadratic Formula

The roots of ax2 + bx + c = 0 can be found using x = [−b ± √(b2 − 4ac)] ÷ 2a.

Q57. Answer: (a) ÷ and -

Given:

13 + 6 ÷ 12 - 4 × 5 = 4

Calculation:

13 + 6 ÷ 12 - 4 × 5

Case 1:

13 ÷ 6 + 12 - 4 × 5

2.16 + 12 - 4×5

2.16 + 12 - 20

14.16 - 20

-5.84

Case 1 is not applicable.

Case 2:

13 + 6 - 12 ÷ 4 × 5

13+ 6 - 3 × 5

13+ 6 - 15

19- 15

Case 2 is applicable.

Thus, two signs should be interchanged is ' ÷ and -'.

Q58. Answer: (a) Sanskrit

the correct answer is 'Sanskrit'.

Key Points

• The 8th schedule of the Indian constitution consists of languages to be used by states for official purposes.

• This schedule consists of 22 languages.

• There are 6 languages so far considered as classical languages:

1. Tamil in 2004,

2. Sanskrit in 2005,

3. Telugu in 2008,

4. Kannada in 2008,

5. Malayam in 2013,

6. Odia in 2014.

Additional Information

• The following criteria were laid down to find the eligibility of languages to be classified as classical language.

1. High antiquity of its early texts in history over a period of 1500-2000 years.

2. A body of ancient literature that is considered a valuable heritage by generations of speakers.

3. The literary tradition is original and not borrowed from another speech community.

4. The classical language and literature being distinct from modern, there may also be a discontinuity between the classical language and its later forms or its offshoots.

Q59. Answer: (d) Si

The correct answer is 'Si'.

Key Points

• Silicon is a Non-Metal, it is a Metalloid.

• The elements that show properties that are intermediate between metals and non-metals are called metalloids.

• Metalloid lies at the borderline between metals and non-metals.

• Metalloids have nonmetallic chemical properties in general.

• Metalloids are usually too brittle to have any structural uses.

Additional Information

• Silicon is a chemical element atomic number 14.

• Silicon is mainly used in computer chips as it is a semiconductor.

• Silicon in silicones can be used as a waterproof sealant on roofs, around water pipes.

• It was iscovery by Jons Jacob Berzelius in 1823. Silicon was named by Thomas Thomson in 1817.

Q60. Answer: (b) Only (i) and (ii)

The Correct answer is Only (i) and (ii).

Key Points

• Element X combines with chlorine to form the compound XCl.

• Since X is placed on the left side of the periodic table, it is likely to be an alkali metal (Group 1).

• Alkali metals have one valence electron, which they readily lose to form a positive ion (X^+).

• Alkali metals are known to be metals and solids at room temperature.

• Therefore, the statements (i) and (ii) are correct for element X.

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Additional Information

• Option (iii):

• Non-metals that are gases at room temperature are typically found on the right side of the periodic table (e.g., oxygen, nitrogen).

• Since element X is on the left side, it is unlikely to be a non-metal or a gas.

• Option (iv):

• Elements with five valence electrons belong to Group 15 of the periodic table (e.g., nitrogen, phosphorus).

• These elements are not found on the left side of the periodic table, hence this option is incorrect for element X.

Q61. Answer: (b) M

Given:

Six classmates L, M, N, O, P and Q compare the IGCSE results of their final exam. Each of them scored different marks.

According to given information, we have the possible arrangements as follows:

1. O scored more than N but less than L:

L > O > N

2. P scored less than N but more than Q. L scored less than M. M scored more than N

M > L > O > N > P > Q

After combining all the arrangements, we get:

M > L > O > N > P > Q

Among the six 'M' scored the most.

Q62. Answer: (c) 133

Given:

188, 187, 183, 174, 158,?

The logic in this pattern is:

The correct answer is '133'.

Q63. Answer: (b) Independence Day

The correct answer is 'Independence Day'.

Key Points

• The Prime Minister hoists the National Flag of India at the Red fort in old Delhi on Independence Day.

• India becomes Independent on 15th August 1947.

• On that day the British flag flying on the Red fort was removed and India's national flag was hoisted.

• Pandit Jawaharlal Nehru, The first Prime Minister of India hoisted the flag on this day.

• since then, every year the Prime Minister hoists the flag on Red fort and addresses the nation.

Q64. Answer: (d) 40 hours

Shortcut Trick

Time for P = 18 × (4/3) = 24 hours; Time for Q = 12 × (5/3) = 20 hours.

LCM(24, 20) = 120 (Total Capacity). Efficiencies: P = 5, Q = 6.

In 4 hours, water filled = (5 + 6) × 4 = 44 units.

Efficiency of R = 44 ÷ 5.5 = 8 (Emptying).

Combined efficiency (P + Q − R) = 5 + 6 − 8 = 3. Time = 120 ÷ 3 = 40 hours.

Therefore The correct answer is 40 hr.

Alternate Method

Given: P fills 3/4 in 18 hrs; Q fills 3/5 in 12 hrs. R empties filled part in 5.5 hrs.

Person	Days	Total Work	Efficiency
Pipe P	24	120	5
Pipe Q	20	6	

=> Full time for P = 18 × (4/3) = 24 hours

=> Full time for Q = 12 × (5/3) = 20 hours

=> Work done by P and Q in 4 hours = (5 + 6) × 4 = 44 units

=> Efficiency of R (Emptying) = 44 ÷ (11/2) = 44 × (2/11) = 8 units/hr

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=> Net efficiency (P + Q + R) = 5 + 6 − 8 = 3 units/hr

=> Total time required = 120 ÷ 3 = 40 hours

Therefore The correct answer is 40 hr.

Additional Information

Pipes and Cisterns Efficiency

Efficiency is inversely proportional to time. Filling pipes have positive efficiency while emptying pipes (leaks) have negative efficiency.

Net Work Done

Total Work = Net Efficiency × Total Time. If the net efficiency is positive, the tank fills; if negative, the tank empties.

Q65. Answer: (a) 11 km

Drawing the diagram according to the given information,

1. Sharad walks 4 km towards the west and then turns right and walks 5 km.

2. Again, he turns left and walks 7 km.

3. Finally, he turns to his left and walks 5 km.

Hence, he is '11 km' far from the starting point.

Q66. Answer: (b) 10

The correct answer is '10'.

Key Points

• 10 teams are scheduled to play in the 15th edition of the Indian Premier League, in 2022.

• In this edition, Gujrat Titans defeated Rajasthan Royals by 7 wickets.

• CVC Captain partners own the franchise.

• The team played under the captaincy of Hardik Pandey and was coached by Ashish Nehra.

• It was the maiden IPL for Gujrat Titans.

• The final match took place at Narendra Modi Stadium, in Ahmedabad.

Additional Information

• Tata Group was declared the official sponsor of the Indian Premier League, 2022.

• Tata Group will also be the title sponsor of IPL, 2023.

Q67. Answer: (b) Paternal and maternal DNA

The correct answer is 'Paternal and maternal DNA'.

Key Points

• Genes carry the information that determines your traits (say: trates), which are features or characteristics that are passed on to you — or inherited — from your parents.

• Each cell in the human body contains about 25,000 to 35,000 genes.

• DNA, or deoxyribonucleic acid, is the hereditary material in humans and almost all other organisms. Nearly every cell in a person's body has the same DNA.

Q68. Answer: (d) 79°

Shortcut Trick

For any quadrilateral ABCD, the angle formed by the bisectors of two adjacent angles (say, angle C and angle D) is equal to half the sum of the other two angles (angle A and angle B):

angle DOC = (angle A + angle B) ÷ 2

=> angle DOC = (86° + 72°) ÷ 2

=> angle DOC = 158° ÷ 2 = 79°

Therefore The correct answer is 79°.

Alternate Method

Given:

In quadrilateral ABCD, angle A = 86° and angle B = 72°.

The bisectors of angle C and angle D meet at O.

Formula Used:

1. Sum of interior angles of a quadrilateral = 360°

2. Sum of angles of a triangle = 180°

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Calculations:

In quadrilateral ABCD, the sum of all interior angles is 360°:

=> angle A + angle B + angle C + angle D = 360°

=> 86° + 72° + angle C + angle D = 360°

=> 158° + angle C + angle D = 360°

=> angle C + angle D = 360° − 158°

=> angle C + angle D = 202°

Since OC and OD are the angle bisectors of angle C and angle D respectively:

=> angle OCD = angle C ÷ 2

=> angle ODC = angle D ÷ 2

In ΔDOC, the sum of angles is 180°:

=> angle DOC + angle OCD + angle ODC = 180°

=> angle DOC + (angle C ÷ 2) + (angle D ÷ 2) = 180°

=> angle DOC + (angle C + angle D) ÷ 2 = 180°

=> angle DOC + 202° ÷ 2 = 180°

=> angle DOC + 101° = 180°

=> angle DOC = 180° − 101°

=> angle DOC = 79°

Option Analysis:

• Option (1) 91°: Incorrect, as this would imply the sum of angle C and angle D is 178°, which does not satisfy the quadrilateral angle sum property with the given angle A and angle B.

• Option (2) 69°: Incorrect, as this would require the sum of angle C and angle D to be 222°, which is mathematically inconsistent with the given values.

• Option (3) 101°: Incorrect, as 101° is the value of half the sum of angle C and angle D, not the angle angle DOC itself.

• Option (4) 79°: Correct, as calculated using the angle sum properties of quadrilaterals and triangles.

Therefore The correct answer is 79°.

Additional Information

Angle Bisector Theorem in Quadrilaterals

The angle formed by the bisectors of two adjacent angles of a quadrilateral is equal to half the sum of the remaining two angles. For example, angle DOC = (angle A + angle B) ÷ 2.

Sum of Interior Angles of a Polygon

The sum of the interior angles of any n-sided polygon is given by the formula (n − 2) × 180°. For a quadrilateral (n = 4), the sum is (4 − 2) × 180° = 360°.

Angle Bisectors of Opposite Angles

If the bisectors of opposite angles of a quadrilateral (say, angle A and angle C) intersect, the angle between them is equal to half the difference of the other two angles: |angle B − angle D| ÷ 2.

Q69. Answer: (b) 1

Given:

Digits in the number 417593286 is arranged in ascending order from left to right.

Digits that will remain unchanged as compared to that in the original number is 1.

Hence, the correct answer is Option (2).

Q70. Answer: (d) 7.2

Shortcut Trick

For a mean proportion 3.2 : x :: x : 16.2, we use the property $x^2 = a \times b$.

$x = \sqrt{(3.2 \times 16.2)}$

$x = \sqrt{(32 \times 162 \div 100)} = \sqrt{(16 \times 2 \times 81 \times 2 \div 100)}$

$x = (4 \times 2 \times 9) \div 10 = 72 \div 10 = 7.2$

Therefore The correct answer is 7.2.

Alternate Method

Given: 3.2 : x :: x : 16.2

Formula Used: Product of Means = Product of Extremes

=> x × x = 3.2 × 16.2

=> x^2 = 51.84

=> x = √51.84

=> x = 7.2

Therefore The correct answer is 7.2.

Additional Information

Mean Proportion

If a, b, and c are in continued proportion such that a : b :: b : c, then b is the mean proportional to a and c, where b = √(ac).

Third Proportional

If a : b :: b : c, then c is called the third proportional to a and b, calculated as c = b^2 ÷ a.

Fourth Proportional

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

Q71. Answer: (d) 48U36

The pattern followed here is:

Therefore, the correct answer is '48U36'.

Q72. Answer: (c) Only conclusion II follows

Statements:

Some woods are charcoals

Some petrol is diesel

All diesel are fossils

Conclusions :

(I) Some petrol are charcoals → False (No direct relationship is given between petrol and charcoals, so it may be possible but not defined)

(II) Some fossils are petrol → True (Some petrol is diesal and all diesal are fossils, so some fossils are petrol)

(III) Some woods are diesel → False (No direct relationship is given between woods and diesel, so it may be possible but not defined)

Hence, 'Only conclusion II follows'.

Q73. Answer: (a) U

According to the given information, we have the following possible arrangements:

1) Q is taller than T but shorter than U

U > Q > T

2) U is shorter than P

U < P

3) R is taller than only three other friends and T is taller than only one friend

-- > -- > R > Q > T > S

After combining all the arrangements, we get

P > U > R > Q > T > S

Therefore, 'U' is the second tallest among all the friends.

Q74. Answer: (d) Directive principles of state policy

The correct answer is 'Directive principles of state policy'.

Key Points

• The main feature borrowed from the constitution of Ireland is the Directive principles of state policy in 1937, but the idea was generated in Spain.

• DPSP are an integral part of Indian Constitution and is listed in Part IV, article 36- 51.

• DPSP are non-justiciable in nature.

• The Sapru community in 1945 suggested two categories of individual rights i.e. Justiciable and non-justiciable rights.

• The instrument and instructions from GOI Act 1935 were taken as DPSP in the constitution.

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Q75. Answer: (a) 1

Alphabetic series

LOVABLE

Such pair is AB.

Thus, the correct answer is '1'.

Q76. Answer: (b) i - b, ii - d, iii - c, iv - e, v - a

The correct answer is 'i - b, ii - d, iii - c, iv - e, v - a'

Key Points

• The formula of Benzene is C6H_(6.)

• The formula of Ethylene is H2C=CH2.

• The formula of Acetaldehyde is CH3-CHO.

• The formula of Acetone is CH3COCH3.

• The formula of Ethane is CH3CH3.

Q77. Answer: (d) 95.90%

Total exports of Company B

22.6 + 32.1 + 30.6 + 34.5 + 32.4 + 38.6 + 45.3 = 236.1

=> Average exports of Company B = 33.73

Total exports of Company C

21.9 + 29.4 + 37.8 + 33.2 + 34.2 + 47.3 + 42.4 = 246.2

=> Average exports of Company C = 35.17

Required percentage = [(33.73) / (35.17)] × 100 = 95.90%

Q78. Answer: (c) Stethoscope

The correct answer is 'Stethoscope'.

Key Points

• Heartbeat is the periodic signal resulting from double circulation.

• It is caused by relaxation and contraction of heart muscles.

• The instrument used to measure heartbeat:

• A stethoscope is used as an instrument to measure heartbeat.

• The normal heart rate of a human being is 72 beats per minute.

Q79. Answer: (d) 5

Shortcut Trick

Each term in the expression follows the pattern (A × var − B) ÷ var = A − (B ÷ var).

The equation simplifies to: (15 − 9/x) + (15 − 9/y) + (15 − 9/z) = 0.

Combine constants: (15 + 15 + 15) − 9(1/x + 1/y + 1/z) = 0 => 45 = 9 × Sum.

Direct Calculation: Sum of reciprocals = 45 ÷ 9 = 5.

Therefore The correct answer is 5.

Alternate Method

Given:

((15x − 9)/x) + ((15y − 9)/y) + ((15z − 9)/z) = 0

Formula Used:

Algebraic expansion: (a − b)/c = (a/c) − (b/c)

Calculations:

=> (15x/x − 9/x) + (15y/y − 9/y) + (15z/z − 9/z) = 0

=> (15 − 9/x) + (15 − 9/y) + (15 − 9/z) = 0

=> 15 + 15 + 15 − 9/x − 9/y − 9/z = 0

=> 45 − 9(1/x + 1/y + 1/z) = 0

=> 9(1/x + 1/y + 1/z) = 45

=> (1/x + 1/y + 1/z) = 45 ÷ 9

=> 1/x + 1/y + 1/z = 5

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Therefore The correct answer is 5.

Additional Information

Fraction Splitting Rule

For any expression (ax + b)/x, it can be decomposed into a + b/x. This is a fundamental technique for simplifying algebraic fractions.

Sum of Reciprocals

In symmetric equations involving variables x, y, and z, the sum of reciprocals (1/x + 1/y + 1/z) often appears as a consolidated term after simplification.

Linear Symmetry

When variables appear in identical structures within an equation, the system is symmetric, and the variables often share a common relationship to the final constant.

Q80. Answer: (b) KAVACH

The correct answer is 'KAVACH'.

Key Points

• 'Kavach' system is an anti-collision test conducted by the Indian Railways to check the indigenous development system to avoid rail accidents.

• This will be the world's cheapest automatic train collision protection system.

• It will cost 50 lakh rupees per kilometer to operate compared to about 2 crore rupees worldwide.

Additional Information

• The test involved two trains - one with the railway minister on board and the other with the chairman of the Railway Board - hurtling towards each other at full speed.

• 'Kavach' automatically stopped the train before 380 meters of other Locomotive at the front.

Q81. Answer: (c) Bharat Financial Inclusion Limited

The correct answer is 'Bharat Financial Inclusion Limited'.

Key Points

• The Board of Directors of IndusInd Bank Ltd. (“IndusInd”) and the Board of Directors of Bharat Financial Inclusion Limited at their respective meetings held today, have approved a merger of the two entities to create a stronger and more sustainable platform for Financial Inclusion.

• The merger will be effected through an all-stock transaction of Bharat Financial Inclusion Limited into IndusInd through a Composite Scheme of Arrangement (“Scheme”).

• The Scheme contemplates merger of Bharat Financial with IndusInd and simultaneous transfer of Bharat Financial Inclusion Limited’s Business Correspondent operations into a Wholly Owned Subsidiary of IndusInd, which shall be incorporated after receipt of requisite regulatory approvals (“BC-WOS”).

Q82. Answer: (a) (c)

The correct answer is '(c) - A coil and a bar magnet moving in the same direction with the same speed'.

Key Points

• Faraday's law of electromagnetic induction states that when the magnetic flux linked with a coil changes, an emf is induced in it.

• It is clear that in all given methods, magnetic flux linked with coil is changing, therefore voltage will induce in coil by all the given methods.

Q83. Answer: (b) carbon

.The correct answer is 'carbon'.

Key Points

• Carbon shows catenation to a maximum extent because of its electronic configuration and tendency to form strong covalent bonds.

• Strength of Carbon-Carbon Bonds: The carbon-carbon (C-C) bond is very strong, making carbon chains and rings stable under a wide range of conditions. This stability is critical for the existence of long-chain molecules, which are ubiquitous in organic compounds..

• Versatility of Carbon Compounds: The capacity for catenation, combined with the ability of carbon to form stable bonds with other elements such as hydrogen, oxygen, nitrogen, and sulfur, leads to an extraordinary variety of compounds. This diversity is the basis of organic chemistry and is crucial for the biochemical processes of living organisms.

• The bond energy of C-C bond is greater than N-N bond and thus catenation in nitrogen is restricted to 2 or 3 nitrogen atoms.

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Q84. Answer: (a) Phosphorus

The correct answer is 'Phosphorus'.

Key Points

• ADP is continually converted to ATP by the addition of a phosphate during the process of cellular respiration.

• ATP carries much more energy than ADP.

• As the cell requires more energy, it uses energy from the breakdown of food molecules to attach a free phosphate group to an ADP molecule in order to make ATP.

Q85. Answer: (c) [figure]

The correct answer is 'option3'.

Key Points

• After reflection, a ray of light incident parallel to the principal axis passes through the focus in case of a Convex lens.

-

Q86. Answer: (d) A

Given:

A, B, C, D, W, X, Y and Z are sitting around a square table facing the centre of the table. Some of them are sitting at the corners, while some are sitting at the middle of the sides.

Solution:

(1) C sits at one of the corners.

(2) C sits third to the left of W.

(3) A does not sit at any of the corners.

(4) A is not an immediate neighbour of C.

(5) Y sits second to the right of A.

(6) Only three people sit between B and D.

(7) B is an immediate neighbour of Z.

• It is possible only in Case 1.

(8) X will be sit on unoccupied seat.

Here, A sits second to the left of Y.

Hence, 'option 4' is the correct answer.

Q87. Answer: (b) 18 years

Shortcut Trick

Venkat's present age = 21 − 12 = 9 years.

Suman's age is twice Venkat's age.

Suman's present age = 9 × 2 = 18 years.

Therefore The correct answer is 18 years.

Alternate Method

Given:

Suman's present age (S) = 2 × Venkat's present age (V)

Venkat's age after 12 years = 21 years

Calculations:

=> V + 12 = 21

=> V = 21 − 12

=> V = 9 years

=> S = 2 × V

=> S = 2 × 9

=> S = 18 years

Therefore The correct answer is 18 years.

Additional Information

Ages in Ratio

If the ratio of ages of A and B is x:y, their ages can be assumed as xk and yk respectively.

Age After 'n' Years

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If the present age is 'x', then the age after 'n' years will be (x + n).

Age 'n' Years Ago

If the present age is 'x', then the age 'n' years ago was (x − n).

Q88. Answer: (a) Barchan

The correct answer is 'Barchan'.

Key Points

• Barkhans are produced by the action of wind in one direction.

• They are created in the desert when huge amounts of sands are complemented by the supply of steady wind from one direction.

• The change in the direction of the wind and the amounts of sands determine the shapes of the sand dune.

• Barkhans constitute a crescent-shaped sand dune.

• The term was coined in 1881 by Russian naturalist Alexander von Middendorf.

• Barkhans are spelled synonymously with barchans, these crescent-shaped sand dunes are created by the direction of continuous wind coming from one side. Barchan’s convex side is towards the direction of the wind.

• In India, they are commonly found in That desert, Rajasthan.

Q89. Answer: (a) 24 minutes

Shortcut Trick

Total Capacity (LCM of 60, 30) = 60 units.

Efficiency of A = 1 unit/min; Efficiency of B = 2 units/min.

Average efficiency per minute = (Efficiency of B + Combined efficiency of A & B) ÷ 2

Average efficiency = (2 + 3) ÷ 2 = 2.5 units/min.

Time required = Total capacity ÷ Average efficiency = 60 ÷ 2.5 = 24 minutes.

Therefore The correct answer is 24 min.

Alternate Method

Person	Days	Total Work	Efficiency
Pipe A	60 min	60 units	1
Pipe B	30 min	2	

Given: Filling time for A = 60 min, B = 30 min. For half time (t/2) only B works, for remaining (t/2) both A and B work.

Formula Used: Total Work = Efficiency × Time

=> Total capacity = LCM(60, 30) = 60 units.

=> Efficiency of Pipe A = 60 ÷ 60 = 1 unit/min.

=> Efficiency of Pipe B = 60 ÷ 30 = 2 units/min.

=> Efficiency of (A + B) = 1 + 2 = 3 units/min.

=> Let the total time be t minutes.

=> (t/2) × (Efficiency of B) + (t/2) × (Efficiency of A + B) = 60

=> (t/2) × 2 + (t/2) × 3 = 60

=> t + 1.5t = 60

=> 2.5t = 60

=> t = 60 ÷ 2.5 = 24 minutes.

Therefore The correct answer is 24 min.

Additional Information

Pipes & Cisterns Efficiency

Efficiency is inversely proportional to time. If a pipe fills a tank in x hours, its efficiency is 1/x per hour.

Combined Efficiency Rule

When multiple pipes work together, their individual efficiencies are added. For inlet pipes it is positive, and for outlet/leakage pipes it is negative.

Alternate Work Pattern

In problems where pipes work for specific durations, calculate the work done in one complete cycle or specific time slots before summing to equal the total capacity.

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Q90. Answer: (a) Connective tissue

The correct answer is 'Connective tissue'.

Key Points

• Bone is a type of specialized connective tissue.

• Connective tissues are specialized to connect and anchor Bones.

• They give support to various parts of creating packaging around the organs.

• The tissue is composed of a gel-like intercellular substance called medium or matrix, which forms the main bulk.

• Bones is a porous, highly vascular, mineralized, hard, and rigid.

Additional Information

• Muscular tissue: The muscular system is composed of specialized cells called muscle fibers. Their predominant function is contractibility.

• Epithelial tissue: The epithelium is a type of body tissue that forms the covering on all internal and external surfaces of your body, lines cavities, and hollow organs and is the major issue in glands.

• Nervous tissue: Nervous or nerve tissue is the main tissue of our nervous system. It monitors and regulates the functions of the body.

Q91. Answer: (b) Translocation

The correct answer is 'Translocation'.

Key Points

• Translocation is the movement of materials from leaves to other tissues throughout the plant.

• Plants produce carbohydrates (sugar) in their leaves by photosynthesis but non-photosynthetic parts of plants also require carbohydrates and other organic and non-organic materials.

• For this reason, nutrients are translocated from sources to other parts of plants.

Additional Information

• Diffusion: It is the process of movement of molecules from a region of higher concentration to a region of lower concentration. Diffusion in plants is a very important process for photosynthesis where carbon dioxide from the stomata diffuses into the leaves and finally into the cells.

• Osmosis: It is a process by which plants maintain their water content despite the constant water loss due to transpiration.

• Transpiration: It is a process that involves loss the of water vapor through the stomata of plants.

Q92. Answer: (d) East, 360 m

Drawing the figure as per given information,

• Pinky walked 160 m towards north, then

• she turned right and walks 240 m. Then

• she turned right and walked 280 m, then

• she turned left and walked 120 m.

• Finally, she turned left and walked 120 m

here, she is East, 360 m from the starting position.

Hence, 'option 4' is the correct answer.

Q93. Answer: (b) 19

Shortcut Trick

Let father's age be F and son's age be S.

From first condition: $F + S = 3S + 6 \rightarrow F - 2S = 6$.

From second condition (after 2 years): $2(F + 2) = 5(S + 2) - 7 \rightarrow 2F - 5S = -1$.

Solving these: $2(2S + 6) - 5S = -1 \rightarrow 4S + 12 - 5S = -1 \rightarrow S = 13$.

$F = 2(13) + 6 = 32$. Difference $= 32 - 13 = 19$.

Therefore The correct answer is 19 years.

Alternate Method

Let present age of Father = F and present age of Son = S.

According to Condition 1:

=> $F + S = 3S + 6$

=> $F - 2S = 6$ ... (i)

According to Condition 2 (After 2 years):

=> 2 × (F + 2) = 5 × (S + 2) − 7

=> 2F + 4 = 5S + 10 − 7

=> 2F − 5S = −1 ... (ii)

Multiply equation (i) by 2:

=> 2F − 4S = 12 ... (iii)

Subtracting (ii) from (iii):

=> (2F − 4S) − (2F − 5S) = 12 − (−1)

=> S = 13

Substituting S in (i):

=> F − 2(13) = 6 => F = 6 + 26 = 32

=> Age Difference = 32 − 13 = 19

Therefore The correct answer is 19 years.

Additional Information

Constant Age Difference

The difference between the ages of two individuals remains constant at any point in time.

Ratio Method for Age Problems

If the ratios of ages are given for two different years, ensure the ratio difference between the two individuals is equated to find the value of one unit.

Age After 'n' Years

If present age is X, age after n years = X + n, and age n years ago = X − n.

Q94. Answer: (a) 386

The logic follows here is:

Hence, 'Option 1' is the correct answer.

Q95. Answer: (b) 10°

The correct answer is 10°.

Key Points

• If a ray incident on the concave mirror passes through the center of the curvature, the reflected ray will retrace its path.

CONCEPT:

• i=r

• For the spherical mirror, At a point where the incident ray falls, it follows the law of reflection i.e., the incident angle is equal to the reflected angle.

• The normal line for this law of reflection is the line that passes through the center.

• When a ray incident on a mirror at 90^0 (On the normal line), it will reflect back at the same path.

EXPLANATION:

• The ray of light passes through the center of curvature of a concave mirror, it strikes the mirror along the normal ray It incidences on the mirror at an angle of 90^0.

• Hence, the angle of incidence (i) = 10^0.

According to the Law of Reflection,

Angle of reflection (r) = 100

• Hence, angle i = angle r.

Q96. Answer: (c) Cu(OH)2

The correct answer is 'Cu(OH)2'.

Key Points

• Alkali - A chemical that can dissolve in water, combine with acids to form salts, and make acids less acidic.

• Alkalies have a bitter taste and turn certain dyes blue.

• All bases are not alkalies, water-soluble bases are called alkalies.

• Here, all given options except Cu(OH)2 dissolves in water.

• Cu(OH)2 do not dissolve in water but reacts with acids to neutralize them.

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Q97. Answer: (a) A

Given:

Six friends, A, B, C, D, E and F, are sitting in a circle facing the centre of the circle.

Solution:

(1) A is 2nd to the right of E.

(2) F is 3rd to the right of B.

(3) B and D are immediate neighbours.

• it is possible only Case 1 Further it will be divided in two sub cases.

(4) C is second to the right of D.

• It is possible only in Case 1(b).

Here, A sits between D and F.

Hence, 'Option 1' is the correct answer.

Q98. Answer: (b) One-third of the members retire every second year.

The correct answer is 'One-third of the members retire every second year'.

Key Points

• Rajya Sabha:

• It is also known as the Upper House of Parliament.

• Ex-officio Chairman: The Vice President of India

• Rajya Sabha is not subjected to dissolution. Therefore One-third of the members retire every second year.

• Composition:

• The maximum strength is 250, out of which: 238 members are representatives of the states & UTs (elected indirectly).

• 12 are nominated by the President.

• Election Representatives:

• The representatives of states are elected by the members of state legislative assemblies.

Q99. Answer: (c) Lord Chelmsford

The correct answer is 'Lord Chelmsford'.

Key Points

• The Rowlatt Act was passed by the government under the period of Lord Chelmsford.

• It was passed in February 1919. Every single Indian member of the Central Legislative Council opposed it.

• The act authorised the government to imprison any suspect without trial and conviction in the court of law.

• It enables the government to suppress the habeas corpus.

• They wanted to replace the provision of repression during wartime Defence of India Act 1915 by a permanent law.

• It was based on the report of Justice S.A.T. Rowlatt's Committee of 1918.

• The act was resented by the Indian public and opposed by all Indian members of the Council.

• Gandhi organised a protest movement which led to the Massacre of Amritsar (April 1919).

• The act was never actually implemented.

Q100. Answer: (c) 2010

The correct answer is '2010'.

Key Points

• an expert group was set up by the Ministry of Petroleum & Natural Gas on August 31, 2009 to suggest 'a viable and sustainable system of pricing of petroleum products' in India.

• The expert group, under the chairmanship of Kirit Parikh, submitted its report on February 2, 2010.

• One of the major recommendations was to phase out APM and allow most of the oil products to be market-determined.

• On the recommendation of the expert group, the Government of India decided, on June 25, 2010, to allow the pricing of a few major petroleum products on the basis of a free-market mechanism.

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