RRB Group D Previous Year Paper (Held on: 22 Aug 2022 Shift 2)

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

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CBT

Q1. Starting from his house, Varun walks 60 m towards the north. He then takes a right turn and walks 30 m. He then takes a right turn and walks 90 m. Finally, he takes another right turn and walks 30 m. How far and in which direction is Varun now from his house? (All turns are 90 degree turns only)

(a) 25 m, East
(b) 30 m, North
(c) 25 m, South
(d) 30 m, South

Q2. Ramesh wants to choose a material for making filament of a bulb. The chosen material should possess which of the following properties?

(i) Low melting point

(ii) Ability to glow at high temperatures

(iii) High resistance

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

Q3. Sindhu Darshan festival is celebrated in which part of India?

(a) Punjab
(b) Uttar Pradesh
(c) Sikkim
(d) Ladakh

Q4. Name the firm that has acquired neo bank Avail Finance in March 2022?

(a) Paytm
(b) Phonepay
(c) Uber
(d) Ola

Q5. Which of the following foods is high in iron?

(a) Milk
(b) Butter
(c) Jaggery
(d) Rice

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Q6. The phloem is the plant's vascular tissue that transports _____.

(a) water
(b) nutrients
(c) Gases
(d) oxygen

Q7. Which of the following is NOT a true statement?

(a) All rectangles are parallelograms.
(b) Sum of any pair of adjacent angles of a rectangle is 180°.
(c) Diagonals of a rectangle do not bisect each other.
(d) Opposite sides of a rectangle are congruent and parallel.

Q8. The total surface area of a cylinder of radius 70 m and height 140 m, is:

(a) 61,524 m²
(b) 82,500 m²
(c) 5124 m²
(d) 92,400 m²

Q9. The mean proportional between the numbers p and q is 8. Which of the following pairs of numbers can be the values of p and q?

(a) 12 and 16
(b) 10 and 6
(c) 16 and 4
(d) 12 and 3

Q10. For a grouped data, if x_i is the class mark and f_i is the corresponding frequency, then by direct method, mean x is given by:

(a) (∑ f_i x_i)/(∑ f_i)
(b) ∑ f_i x_i
(c) (∑ x_i)/(∑ f_i)
(d) (∑ f_i x_i)/(∑ x_i)

Q11. The following question is based on the given six, 4-digit numbers.

(Left) 8347, 5486, 9627, 4913, 8721, 6418 (Right)

(For example, 2456 : 6 = digit in unit's place, 5 = digit in ten's place, 4 = digit in hundred's place, 2 = digit in thousand's place)

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

What will be the resultant if the digit in hundred's place of the largest number is added to the digit in thousand's place of the smallest number?

(a) 10
(b) 7
(c) 9
(d) 8

Q12. The average of the first twelve multiples of 11 is:

(a) 69.5
(b) 70.5
(c) 71.5
(d) 68.5

Q13. Seven surgeons, W, X, Y, Z, A, B and C, were sitting around a square table, facing the centre. Four of them are sitting at the corners while three are sitting at the exact centre of the sides. One of the centre of sides was empty. C, at one of the corners, was immediately next to both B and Y. Z was immediately next to both B and X. A was at the immediate right of X. Which surgeon was third to the right of W?

(a) C

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(b) B
(c) X
(d) Y

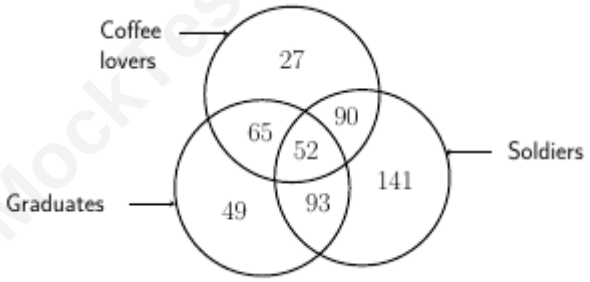
Q14. Which of the following elements shows maximum valence electrons?

(a) F
(b) Al
(c) H
(d) N

Q15. The direction of a magnetic field due to a straight current carrying conductor can be determined using:

(a) Fleming's left-hand rule
(b) Right hand thumb rule
(c) Fleming's right-hand rule
(d) Left hand thumb rule

Q16. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



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

(a) The number of soldiers who are neither coffee lovers nor graduates is 193.
(b) The number of soldiers who are also coffee lovers is 27.
(c) The number of graduates who are also coffee lovers but not soldiers is 65.
(d) The number of coffee lovers who are both graduates and soldiers is 90.

Q17. 51 men can complete a work in 12 days. Four days after they started working 6 more men joined them. How many days will they now take to complete the remaining work?

(a) 81/19 days
(b) 59/19 days
(c) 73/19 days
(d) 67/19 days

Q18. From the numbers 51, 52, 53, ...100, find the sum of the smallest and the greatest prime numbers are given.

(a) 150
(b) 139
(c) 123
(d) 154

Q19. What is the angle traced by the minute hand in 48 minutes?

(a) 190°
(b) 288°
(c) 372°
(d) 420°

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Q20. Which of the following numbers will replace the question mark (?) in the given series?

8, 9, 20, 63, 256, ?

(a) 1286
(b) 1284
(c) 1285
(d) 1280

Q21. We can prepare eco-friendly carry bags with _____.

(a) glass
(b) rubber
(c) paper
(d) plastic

Q22. Every year, 'Parakram Divas' is celebrated on the birth anniversary of which Indian Nationalist?

(a) Lala Lajpat Rai
(b) Netaji Subhash Chandra Bose
(c) Bhagat Singh
(d) Rani Lakshmi Bai

Q23. What is the correct order of elements according to their valence shell electrons?

(a) Ne > N > F > Be
(b) F > O > C > Li
(c) Li > O > C > F
(d) B > C > O > F

Q24. To cook some foods faster we can use _____.

(a) sodium chloride
(b) baking powder
(c) bleaching powder
(d) ammonium chloride

Q25. The equation $x^2 + 7x + 6 = 0$ can be written as:

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

Q26. In April 2022 the Lok Sabha passed the Constitution (Scheduled Castes and Scheduled Tribes) Orders (Second Amendment) Bill, 2022 which seeks to amend the Constitution to include Gonds and associated tribes in the Scheduled Tribes category in certain districts of _____.

(a) Himachal Pradesh
(b) Sikkim
(c) Uttar Pradesh
(d) Assam

Q27. What is the name of the phenomenon of wearing down of relief variations of the surface of the Earth through erosion?

(a) Germination
(b) Solidification
(c) Eruptions
(d) Gradation

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Q28. In January 2022, the Government of India launched which portal to share key performance indicates of the coal sector?

(a) Koyla Data
(b) Koyla Darpan
(c) Koyla Bit
(d) Koyla Gyan

Q29. Simplify 3(3x - 2) + x (4x/2) + 15 - 12.

(a) $2x^2 + 9x + 6$
(b) $2x^2 + 9x + 3$
(c) $2x^2 + 9x - 3$
(d) $2x^2 + 6x - 3$

Q30. Some people are playing on a football ground. Only two are wearing red coloured T-shirts. Exactly three are wearing yellow-coloured T-shirts. The one who is wearing a red T-shirt passed the ball to the only individual wearing a saffron coloured T-shirt. The person wearing a white coloured T-shirt tackled the person wearing the saffron coloured T-shirt, and then passed the ball to the player who is wearing the green coloured T-shirt. No other individual is playing on the ground.

How many total players are playing football on the ground?

(a) 10
(b) 7
(c) 9
(d) 8

Q31. Many scientists before Mendel had started studying the inheritance of traits in peas and other organisms, but Mendel succeeded in giving the laws of Inheritance. Some reasoning for Mendel's success are mentioned below. All are correct except one. Select the INCORRECT reasoning.

(a) He worked with a small sample size.
(b) He kept a count of individuals of a particular trait in each generation.
(c) He studied the inheritance of one character at a time, whereas scientific before him had considered the organism as a whole.
(d) He blended his knowledge of Science and Mathematics.

Q32. Select the set in which the numbers are related in the way as are the numbers of the following sets.

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

(36, 78, 13)

(121, 77, 7)

(a) (36, 72, 10)
(b) (64, 85, 12)
(c) (9, 56, 18)
(d) (49, 63, 9)

Q33. The equivalent fraction of 4.2222... is:

(a) 38/9
(b) 422/99
(c) 42/99
(d) 38/100

Q34. In a right-angled triangle, if the hypotenuse is 4 units greater than one side 8 units greater than the other, then find the area of the triangle.

(a) 16 sq. units
(b) 32 sq. units
(c) 100 sq. units

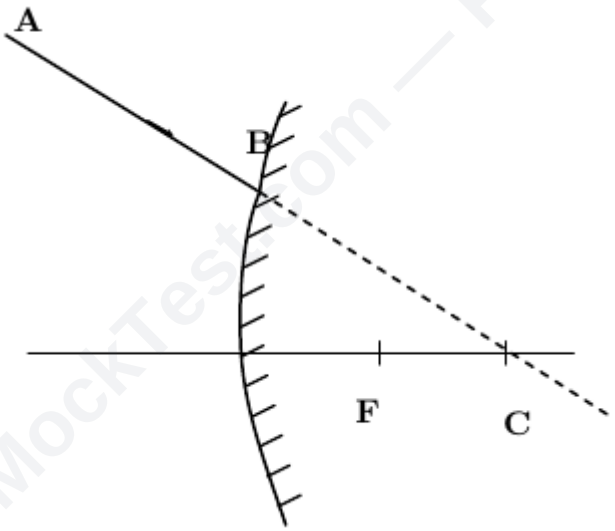
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(d) 96 sq. units

Q35. 3 pencils and 5 pens together cost Rs. 81, whereas 5 pencils and 3 pens together cost Rs. 71. The cost of 1 pencil and 2 pens together is:

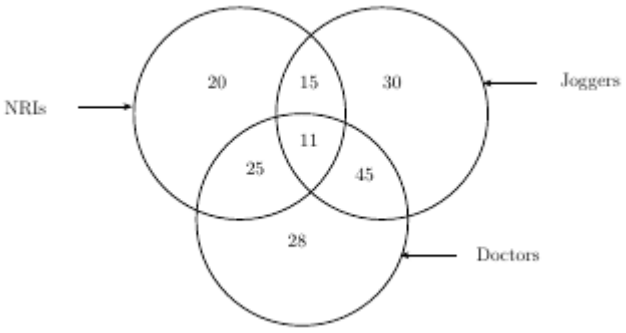
(a) Rs. 35
(b) Rs. 26
(c) Rs. 31
(d) Rs. 29

Q36. A light ray AB is incident on a convex mirror as shown in the figure. What will be the angle of reflection?



(a) 0°
(b) 30°
(c) 90°
(d) 45°

Q37. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



How many such doctors are there who are also joggers but NOT NRIs?

(a) 75
(b) 56
(c) 28
(d) 45

Q38. What will be the fourth next member of the homologous series of the compound propene?

(a) C6H12
(b) C7H14
(c) C4H8
(d) C2H4

Q39. To which of the following organisms is the Cell Theory given by Schleiden Schwann NOT applicable?

(a) Viruses
(b) Fungi
(c) Animals
(d) Algae

Q40. The position of how many letters will remain unchanged if each of the word 'ACQUIRE' is arranged in alphabetical order?

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

Q41. How many languages as on June 2022 have the status of 'classical language' in India?

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

Q42. In this question, a group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the condition is your answer.

Number/Symbol	**6**	**5**	**&**	**@**	**?**	**9**	**<**	**#**	**2**	**%**	**!**	**3**	**=**	**7**
Code	M	L	R	T	U	P	H	Y	A	V	C	X	D	G

Conditions:

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

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

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

How will '6 < % 2 #' be coded?

(a) Φ Y C A Φ
(b) M H V A Y
(c) Y H V A M
(d) Y Y V A M

Q43. Which aspect of large dams has NOT been criticised?

(a) Economic
(b) Social
(c) Environmental
(d) Psychological

Q44. If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 53478231, what will be the sum of the digits that are second from the left and second from the right?

(a) 6
(b) 4
(c) 10
(d) 8

Q45. Who among the following was the Team India Flag Bearer at the 2022 Commonwealth Games opening ceremony in Birmingham?

(a) Mirabai Chanu
(b) Aditi Ashoke

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(c) Lovlina Borgohain
(d) PV Sindhu

Q46. The resistance of a conductor is directly proportional to:
(a) area of cross section of the conductor
(b) length of the conductor
(c) potential difference applied across the conductor
(d) current flowing through the conductor

Q47. A certain number of people are sitting in a row, facing the north. M is sitting at the extreme left end. K is to the immediate right of M. G is to the immediate right of K. Only five persons are sitting between G and D. D is at the 6^(th) position from the extreme right end. G is at some place towards the left of D. If no other person is sitting in the row, what is the total number of persons seated?
(a) 13
(b) 15
(c) 12
(d) 14

Q48. By selling an item at a 10% profit a seller makes a profit of Rs. 777.70. Find the cost price of the item.
(a) Rs. 7,277
(b) Rs. 7,777
(c) Rs. 7,177
(d) Rs. 7,707

Q49. Six boys, Prateek, Kartik, Yash, Himmat, Dev and Nihit, are sitting in a straight line. All are facing the north direction. Prateek sits second to the left of Kartik. Dev is sitting at one of the extreme ends. Only Prateek is sitting between Yash and Himmat. Kartik sits to the immediate left of Nihit. Himmat sits third to the right of Dev. Who is sitting to the immediate left of Kartik?
(a) Yash
(b) Dev
(c) Himmat
(d) Prateek

Q50. Which of the following numbers will replace the question mark (?) in the given series?
28, 29, 31, 35, 43, ?
(a) 55
(b) 59
(c) 61
(d) 53

Q51. Which of the following devices is/are based on heating effect of electric current?
(i) Incandescent lamp
(ii) Electric geyser
(iii) Electric generator
(a) Only (i)
(b) Both (i) and (ii)
(c) Only (ii)
(d) Both (i) and (iii)

Q52. Two numbers are in the ratio 5 : 3. If difference between the numbers is 54, then find the smaller number.
(a) 91
(b) 135
(c) 115
(d) 81

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Q53. In March 2022, which state government presented 'Children's Budget' for the first time as part of its annual financial plan?

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

Q54. Stepping out from a flower shop, Jaya walks 100 m towards the north. She then takes a right turn and walks 45 m. She then takes right turn and walks 175 m. She then takes a left turn and walks 50 m. She then takes a left turn and walks 75 m to reach a tea stall. How far and in which direction is the flower shop from the tea stall? (All turns are 90 degree turns only)

(a) 105 m, North
(b) 95 m, West
(c) 105 m, West
(d) 95 m, East

Q55. A certain number of people are sitting in a row, facing north, P is to the immediate left of Z. Only one person sits between G and D. G is to the left of D. H is fifth to the left of G. K is to the immediate right of D. P is third to the right of K. If no other person is sitting in the row, what is the total number of persons seated?

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

Q56. As of July 2022, who among the following is the Chairman of 15^(th) Finance Commission of India?

(a) Ashok Lahiri
(b) Anoop Singh
(c) NK Singh
(d) Arvind Mehta

Q57. Based on the given statement, two conclusions are drawn. Find out which conclusion is true based on the statement.

Statement: C < D, E ≥ B, B > D

Conclusions:

1. B > C

2. E < D

(a) Both conclusions 1 and 2 are true
(b) Only conclusion 1 is true
(c) Neither conclusion 1 nor 2 is true
(d) Only conclusion 2 is true

Q58. A shop which sells sarees had offers going on wherein customers could buy 3 sarees and get 2 free. What is the discount that the customer gets?

(a) 50%
(b) 40%
(c) 60%
(d) 30%

Q59. The Fundamental Duties were added in the Indian Constitution by the recommendation of which of the following committees?

(a) Union Constitution Committee
(b) Provincial Constitution Committee
(c) Union Power Committee
(d) Swaran Singh Committee

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Q60. The product of the roots of $x^2 - 7x + 12 = 0$ is _____.

(a) 12
(b) -12
(c) -7
(d) 7

Q61. In a certain code language, 'PTEJAD' is written as 'OUEIAE' and 'FHNOI' is written as 'EIMOI'. How will 'TUPAI' be written in that language?

(a) PUHVA
(b) SUQAI
(c) VUPHI
(d) UVPAH

Q62. In which part of the Indian Constitution is Panchayati Raj described?

(a) Part VIII
(b) Part IX
(c) Part VII
(d) Part VI

Q63. Based on the given statement, four conclusions are drawn. Find out which conclusion is NOT true based on the statement.

Statement: $A < B < C \leq D = E > F > G$

(a) $E > B$
(b) $C \leq E$
(c) $D > G$
(d) $A > E$

Q64. 'Double Circulation' CANNOT be observed in _____.

(a) frog
(b) eagle
(c) fish
(d) snake

Q65. 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.

FAST : JDUU :: SLOW : WOQX :: JUMP : ?

(a) XNOQ
(b) NXOQ
(c) NOXQ
(d) QXON

Q66. Consider the below statements and identify the correct answer.

Statement-I: On heating, the surface of copper powder becomes coated with black copper (II) oxide.

Statement-II: If hydrogen gas is passed over this heated material (CuO), the black coating on the surface turns brown.

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

Q67. Which of the following statements is/are true for a DC motor?

(i) The function of the split rings is to reverse the flow of current.

(ii) Maximum force is experienced by arms of the coil aligned parallel to the magnetic field

(iii) Reversing current after every half rotation leads to continuous rotation of coil.

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

Q68. The mean proportional of 16 and 144 is
(a) 36
(b) 34
(c) 44
(d) 48

Q69. A convex lens having power 5 D is placed in contact with a concave lens having power -3 D. The focal length of the combination will be:
(a) -50 cm
(b) -0.5 cm
(c) 50 cm
(d) 0.5 cm

Q70. A statement is given followed by two arguments I and II. Read the statement and the arguments carefully and select the appropriate answer from the given options.

Statement:

Last year, only 30 percent of girl students in district X joined under-graduate courses after school, while 95 percent boys joined under-graduate courses.

Arguments:

I. The state government has increased the number of scholarships for girl students in undergraduate courses in government colleges.

II. Many girl students prefer to join vocational courses after school rather than undergraduate courses.

(a) Argument II weakens, while argument I strengthens the statement
(b) Argument I weakens, while argument II strengthens the statement
(c) Both arguments I and II weaken the statement
(d) Both arguments I and II strengthen the statement

Q71. Given below are three statements and three conclusions. Take the statements to be true even if they are at variance with commonly known facts, and decide whether the conclusion/s from the given statements.

Statements:

I. All chairs are desks.

II. All desks are chalks.

III. All chalks are boards.

Conclusions:

I. Some boards are desks.

II. Some chalks are chairs.

III. Some boards are chairs.

(a) Conclusion II and III follow
(b) All the conclusions follow
(c) Conclusions I and III follow
(d) Conclusions I and II follow

Q72. Refer to the following number series and answer the question.

2 5 6 9 8 0 3 8 6 7 2 5 2 2 6 8 3 6 5 3

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

(a) 2
(b) 5

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(c) 3
(d) 4

Q73. Which State Government has in March 2022 launched the 'Dalit Bandhu' welfare scheme for empowering Dalit families of the state and enabling entrepreneurship among them through a Rs. 10 lakh direct benefit transfer per family?

(a) Uttarakhand
(b) Odisha
(c) Telangana
(d) Punjab

Q74. Which of the following terms will replace the question mark (?) in the given series to make it logically complete?

EHT-13, HKW-17, LOA-22, QTF-28, WZL-35, ?

(a) CGT-41
(b) DGT-44
(c) DGS-43
(d) DHR-43

Q75. Simplify:

$(\sin^2 10° + \sin^2 20° + ... + \sin^2 80° + \sin^2 90°)/(\cos^2 20° + \cos^2 40° + \cos^2 50° + \cos^2 70° + \cos^2 45°)$

(a) 6/5
(b) 2
(c) 3/4
(d) 4/3

Q76. The sum of double of the largest two-digit prime number and triple of the largest three-digit prime number is equal to _____

(a) 3185
(b) 3029
(c) 2195
(d) 6523

Q77. The radius of curvature of a given spherical mirror is -20 cm. The focal length of the mirror is:

(a) -10 cm
(b) 40 cm
(c) 10 cm
(d) -40 cm

Q78. Which of the following interchanges of signs would make the given equation correct?

12 ÷ 6 × 18 + 16 - 15 = 5

(a) +, -
(b) ×, ÷
(c) -, ÷
(d) +, ×

Q79. Which flower of Himalaya has antiseptic properties and hence can help in the healing of bruises?

(a) Brahma Kamal
(b) Parthenium
(c) Datura
(d) Ricinus

Q80. Which scheme has been introduced by the Department of Biotechnology, Government of India, for awarding writers for writing original books in Hindu on the subjects related to Biotechnology?

(a) Dr. Jagdish Chandra Bose Hindi Granth Lekhan Puraskar Yojna
(b) Dr. Hargobind Khurana Hindi Granth Lekhan Puraskar Yojna

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(c) Dr. Aryabhatta Hindi Granth Lekhan Puraskar Yojna
(d) Dr. Raman Bose Hindi Granth Lekhan Puraskar Yojna

Q81. Five solutions A, B, C, D and E, when tested with universal indicator, showed pH as 4, 1, 11, 7 and 9, respectively. The pH in increasing order of H^+ ion concentration for these solutions is:
(a) C < D < E < A < B
(b) C < D < E < B < A
(c) C < E < D < A < B
(d) D < C < E < A < B

Q82. At what rate of per cent annum will Rs. 1,300 give Rs. 520 as simple interest in 5 years?
(a) 5%
(b) 4%
(c) 8%
(d) 7%

Q83. In March 2022, in which state has India's first Virtual Smart Grid Knowledge Centre been inaugurated?
(a) Jharkhand
(b) Himachal Pradesh
(c) Haryana
(d) Punjab

Q84. The volume of a cylinder is 5500 m^3. Find its diameter if the cylinder is 70 m high.
(a) 12 m
(b) 8 m
(c) 10 m
(d) 5 m

Q85. Select the set in which the numbers are related in the same way as are the numbers of the following sets.
(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13-Operations on 13 such as adding/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 are not allowed.)
(11, 57, 8)
(12, 63, 9)
(a) (12, 45, 8)
(b) (15, 75, 7)
(c) (10, 48, 6)
(d) (12, 54, 11)

Q86. If $(x + 1/x) = k$, find the value of $x^3 + 1/(x^3)$.
(a) k^3
(b) $k^3 - 3k$
(c) $3k - k^3$
(d) $k^3 + 3k$

Q87. In which state is St. Thomas Cathedral Basilica Church located?
(a) Tamil Nadu
(b) Goa
(c) Maharashtra
(d) Kerala

Q88. Simplify $234 \times [8 - (6 + 2) \times 3] + 4234$.
(a) 423
(b) 490
(c) 940

(d) 324

Q89. The following reaction is an example of _____.

$Mg(OH)_2 + 2HCl \rightarrow MgCl_2 + 2H_2O$

(a) neutralisation reaction
(b) decomposition reaction
(c) combination reaction
(d) precipitate reaction

Q90. Geomorphology, the branch pf Physical Geography is devoted to the study of which of the following fields?

(a) Study of water
(b) Study of soil
(c) Study of landforms
(d) Study of atmosphere

Q91. In February 2022 India won a record-extending fifth U-19 World Cup title, beating which country by four wickets in the final?

(a) Canada
(b) England
(c) Pakistan
(d) Australia

Q92. If each of the digits in the number given below is arranged in the descending order from left to right, what will be the product of the digits that are third from the left and fourth from the right in the new number thus formed?

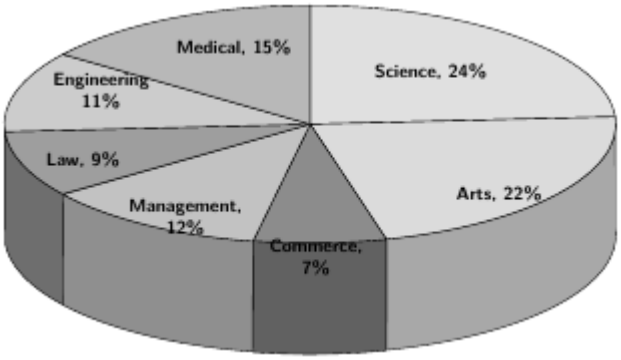
(Left 521987624 (Right)

(a) 21
(b) 28
(c) 35
(d) 36

Q93. Carbon is unable to form C^(4+) ion because _____.

(a) it has tetra valency
(b) it gains electrons easily
(c) it shows catenation property
(d) its formation requires a large amount of energy

Q94. The following chart shows the percentage of students enrolled in different streams in a university. The total number of students enrolled in the university is 15200. Study the chart and answer the question.



How many students are enrolled in Medical, Engineering and Law streams taken together?

(a) 4680
(b) 5320
(c) 5420
(d) 5210

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Q95. For a ray of light undergoing refraction through a triangular glass prism, the angle of deviation is the angle between:

(a) the incident ray and the normal at the point of incidence
(b) the refracted ray and the emergent ray
(c) the incident ray and the refracted ray
(d) the incident ray and the emergent ray

Q96. A starts from X at 9:00 a.m. and reaches Y at 1:00 p.m. on the same day, B also starts from Y at 9:00 a.m. and reaches X at 3 p.m on the same day, following the same route as A. At what time do the two meet?

(a) 11:24 hrs
(b) 11:12 hrs
(c) 10:00 hrs
(d) 11:30 hrs

Q97. The amount of _____ in a plant cell alters its structure in order to facilitate movement.

(a) water
(b) protein
(c) hormones
(d) electro-chemical impulses

Q98. The value of {4 - 3 × [7 - 8 × (2 × 4 - 10)]} =

(a) 65
(b) 73
(c) -65
(d) -25

Q99. The following table shows the number of male and female employees working in four departments of an organization i.e. HR, Production, Marketing and Operations. Study the table and answer the question.

Departments	Male	Female
HR	35	65
Production	160	155
Marketing	176	140
Operations	128	142

What is the ratio of the total number of employees in Production (both male and female taken together) and the total number of employees in Operations (both male and female employees taken together), respectively?

(a) 7 : 3
(b) 8 : 5
(c) 6 : 5
(d) 7 : 6

Q100. Which of the following steps have NOT been taken by the government to attract foreign companies to invest in India?

(a) SEZs setup production units do not have to pay taxes for an initial period of five years.
(b) Flexibility in the taxation system.
(c) Flexibility in the labour laws.
(d) Special Economic Zones are being set up.

ANSWER KEY

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

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

SOLUTIONS

Q1. Answer: (d) 30 m, South

According to the given information,

1) Varun walks 60 m towards the north.

2) He then takes a right turn and walks 30 m.

3) He then takes a right turn and walks 90 m.

4) Finally, he takes another right turn and walks 30 m.

Here, we can see that Varun is 30 m in south direction from the house.

Hence, the correct answer is "30 m, South".

Q2. Answer: (d) Both (ii) and (iii)

The correct answer is 4) Both (ii) and (iii).

Key Points

• Material for Filament of a Bulb:

• The filament of a bulb needs to have a high melting point so that it does not melt when it gets hot. Hence, Statement (i) is not correct.

• The material should have the ability to glow at high temperatures to produce light effectively. Hence, Statement (ii) is correct.

• A high resistance is also required so that the filament can heat up to the required temperature when an electric current passes through it. Hence, Statement (iii) is correct.

• Common materials used for bulb filaments, such as tungsten, possess both of these properties.

Q3. Answer: (d) Ladakh

The correct answer is Ladakh.

Key Points

• Sindhu Darshan festival is celebrated in Ladakh.

• This festival is held every year on the banks of the Indus River, also known as the Sindhu River, which is one of the longest rivers in Asia.

• The festival is a celebration of the river Sindhu, which is considered a symbol of India's identity and civilization.

• It aims to promote the cultural heritage and communal harmony of the region.

• The festival includes traditional music, dance performances, and rituals performed by Buddhist monks.

Additional Information

• The Sindhu Darshan festival was first started in the year 1997.

• The festival is usually celebrated in the month of June every year.

• It attracts tourists from all over the country and abroad, fostering tourism in the Ladakh region.

• Ladakh, known for its stunning landscapes and rich culture, becomes a hub of activities during this festival.

• The festival also highlights the importance of river Sindhu in historical and cultural contexts, emphasizing its role in the sustenance of the civilizations along its banks.

Q4. Answer: (d) Ola

The correct answer is Ola.

Key Points

• Ola acquired neo bank Avail Finance in March 2022.

• Avail Finance is a neo bank that provides financial services to the blue-collar workforce in India.

• With this acquisition, Ola aims to strengthen its financial services portfolio and offer more comprehensive solutions to its users.

• This move is part of Ola's strategy to diversify its business beyond ride-hailing and into financial services.

Additional Information

• Ola is one of the world's largest ride-hailing companies, founded in 2010 by Bhavish Aggarwal and Ankit Bhati.

• In addition to ride-hailing, Ola has expanded into various sectors including electric vehicles, food delivery, and financial services.

• Avail Finance, founded by Ankush Aggarwal and Tushar Mehndiratta, offers products like personal loans and salary advances.

• This acquisition is expected to help Ola leverage Avail Finance's technology and expertise to offer innovative financial products to its driver-partners and customers.

Q5. Answer: (c) Jaggery

The correct answer is Jaggery.

Key Points

• Jaggery is the food that is high in iron. Jaggery, a type of unrefined sugar, is often recommended as a source of iron.

• Milk: While milk is a good source of many nutrients, it is not high in iron.

• Butter: Butter is primarily a source of fat and does not contain a significant amount of iron.

• Rice: While rice does contain some iron, the amount is typically less than that found in jaggery.

• Usage: Jaggery is used in various culinary applications, especially in Indian cuisine. It is used in sweets, beverages, and as a sweetener in cooking.

Additional Information

• Culinary Uses: Jaggery is widely used in various culinary applications, especially in Indian cuisine. It is used in sweets, beverages, and as a sweetener in cooking.

• Industrial Applications: Jaggery has certain industrial applications as well. It is used not only in individual households but also in many eateries, restaurants, clubs, and hostels.

• Cultural and Ceremonial Significance: Beyond its culinary applications, jaggery holds cultural and ceremonial significance in many communities, where it is often used in religious rituals, festive celebrations.

• Traditional Medicine: In Ayurvedic medicine, jaggery is used for its health benefits. It is known as a cardio tonic, blood purifier, and a good source of iron. It is used in heart weakness, blood or skin disorders, anemia, and can prevent asthma and allergic conditions.

Q6. Answer: (b) nutrients

The correct answer is nutrients.

Key Points

• The phloem is the plant’s vascular tissue that transports nutrients, primarily sugars (such as sucrose) produced during photosynthesis, from the leaves to other parts of the plant.

• Function: The phloem is responsible for transporting nutrients (especially sugars) throughout the plant.

• Direction: It moves nutrients from the leaves (where they are produced) to other parts of the plant.

• Components: The phloem consists of sieve tubes, which are elongated cells, and companion cells that support their function.

• Translocation: Nutrient movement through the phloem occurs via a process called translocation.

Additional Information

• Bidirectional Movement: Phloem allows bidirectional movement of nutrients. Sugars move from the source (usually leaves) to the sink tissues (roots, stems, flowers, fruits) for growth and other processes.

• Structure:

• Sieve elements lack a nucleus at maturity and maximize space for translocation.

• Sieve plates have pores and play a crucial role in nutrient exchange.

• Pressure Flow Hypothesis: The pressure flow hypothesis explains how sugars move through the phloem using osmotic pressure gradients.

Applications:

• Textiles: Bast fibers (derived from phloem) contribute to high-quality textiles.

• Ropes and Yarn: Their tensile strength makes them ideal for making ropes and yarn.

• Paper Production: Bast fibers play a role in papermaking.

• Composite Materials: Used in creating composite materials.

Q7. Answer: (c) Diagonals of a rectangle do not bisect each other.

Shortcut Trick

A rectangle is a specific type of parallelogram where all interior angles are 90°.
One of the fundamental properties of all parallelograms (including rectangles) is that their diagonals always bisect each other.
Checking the options: Statement (3) claims diagonals do not bisect each other, which contradicts the basic property of a rectangle.
Therefore The correct answer is Diagonals of a rectangle do not bisect each other.
Alternate Method
Given: Properties of a Rectangle.
Evaluating Statements:
=> Statement 1: A rectangle has two pairs of parallel sides, thus it is a parallelogram. (True)
=> Statement 2: Adjacent angles are both 90°, so 90° + 90° = 180°. (True)
=> Statement 3: By property of parallelograms, diagonals bisect each other. (False)
=> Statement 4: Opposite sides are equal (congruent) and parallel. (True)
Therefore The correct answer is Diagonals of a rectangle do not bisect each other.
Additional Information
Properties of Rectangle Diagonals
In a rectangle, the diagonals are equal in length and bisect each other, but they do not necessarily intersect at 90° unless the rectangle is a square.
Rhombus vs Rectangle
In a rhombus, diagonals bisect each other at right angles (90°), whereas in a rectangle, they are only equal and bisect each other.
Interior Angles Sum
The sum of all interior angles of any quadrilateral is 360°. In a rectangle, each angle is exactly 90°.

Q8. Answer: (d) 92,400 m²

Shortcut Trick
Use the formula for Total Surface Area of a Cylinder: $2\pi r(h + r)$.
Substitute r = 70 and h = 140 into the formula.
Total Surface Area = $2 \times (22/7) \times 70 \times (140 + 70)$
Total Surface Area = $440 \times 210 = 92,400$ m².
Therefore The correct answer is 92,400 m².
Alternate Method
Given:
Radius (r) of the cylinder = 70 m
Height (h) of the cylinder = 140 m
Formula Used:
Total Surface Area (TSA) of a cylinder = $2\pi rh + 2\pi r^2 = 2\pi r(h + r)$
Calculations:
=> TSA = $2 \times (22/7) \times 70 \times (140 + 70)$
=> TSA = $2 \times 22 \times 10 \times 210$
=> TSA = $44 \times 10 \times 210$
=> TSA = 440×210
=> TSA = 92,400 m²
Therefore The correct answer is 92,400 m².
Additional Information
Curved Surface Area of Cylinder
The area of the side surface excluding the top and bottom bases is $2\pi rh$.
Volume of Cylinder
The total space occupied by the cylinder is given by the formula $V = \pi r^2 h$.
Hollow Cylinder TSA
The total surface area for a hollow cylinder is $2\pi(R + r)(h + R - r)$, where R is outer radius and r is inner radius.

Q9. Answer: (c) 16 and 4

Shortcut Trick
Mean proportional between p and q = $\sqrt{(p \times q)}$.

=> √(p × q) = 8

=> p × q = 64

Checking the given options, only 16 × 4 = 64 satisfies the condition.

Therefore The correct answer is 16 and 4.

Alternate Method

Given:

The mean proportional between the numbers p and q is 8.

Formula Used:

If b is the mean proportional between a and c, then $b^2 = a \times c$.

p

:

8

:

q

p × q = 8 × 8 = 64

Mean Proportional = 8

Calculations:

=> p : 8 :: 8 : q

=> p ÷ 8 = 8 ÷ q

=> p × q = 8 × 8 = 64

Now, checking the given options for the condition p × q = 64:

=> Option 1: 12 × 16 = 192 (Incorrect)

=> Option 2: 10 × 6 = 60 (Incorrect)

=> Option 3: 16 × 4 = 64 (Correct)

=> Option 4: 12 × 3 = 36 (Incorrect)

Therefore The correct answer is 16 and 4.

Additional Information

Third Proportional

If a, b, c are in continuous proportion (a:b :: b:c), then c is called the third proportional to a and b. Formula: $c = b^2 \div a$.

Fourth Proportional

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

Duplicate and Sub-duplicate Ratio

The duplicate ratio of a:b is $a^2 : b^2$, and the sub-duplicate ratio of a:b is √a : √b.

Q10. Answer: (a) (∑ f_i x_i)/(∑ f_i)

Solution:

The direct method is the simplest method to find the mean of the grouped data. If the values of the observations are x1, x22222, x33333 ,.....xnn with their corresponding frequencies are f11, f22, f33 ,.....fnn then the mean of the data is given by,

Calculate Mean by the Formula Mean = ∑xii fii / ∑fii. Where fiiiii is the frequency and xiiiii is the midpoint of the class interval.

Calculate the midpoint, xiiiii, we use this formula xiiiii = (upper class limit + lower class limit)/2.

Therefore The mean is (∑ f_i x_i)/(∑ f_i).

Q11. Answer: (a) 10

The given numbers are → (Left) 8347, 5486, 9627, 4913, 8721, 6418 (Right)

Largest number → 9627

Digit in hundred's place: 6

Smallest number → 4913

Digit in thousand's place: 4

When we add the digit in hundred's place of the largest number is added to the digit in thousand's place of the smallest number, we get,

→ 6 + 4 = 10

Hence, the correct answer is "10".

Q12. Answer: (c) 71.5

Shortcut Trick

For an Arithmetic Progression (AP), the Average is always (First term + Last term) ÷ 2.

First term (1st multiple of 11) = 11

Last term (12th multiple of 11) = 11 × 12 = 132

Average = (11 + 132) ÷ 2 = 143 ÷ 2 = 71.5

Therefore The correct answer is 71.5.

Alternate Method

Given:

Number of terms (n) = 12

Multiples of = 11

Formula Used:

Average of first n multiples of x = x × (n + 1) ÷ 2

Calculations:

=> Multiples are 11, 22, 33, ..., 132

=> Sum = 11 + 22 + 33 + ... + 132

=> Sum = 11 × (1 + 2 + 3 + ... + 12)

=> Sum = 11 × [12 × (12 + 1) ÷ 2]

=> Sum = 11 × 6 × 13 = 858

=> Average = Total Sum ÷ Total Numbers

=> Average = 858 ÷ 12

=> Average = 71.5

Therefore The correct answer is 71.5.

Additional Information

Arithmetic Progression (AP) Average

The average of any sequence with a constant common difference is simply the mean of the first and last terms: (a + l) ÷ 2.

Sum of First n Multiples

The sum of the first n multiples of a number k is given by S_n = k × [n(n + 1) ÷ 2].

Average of First n Natural Numbers

The average of the first n natural numbers is (n + 1) ÷ 2. For multiples of k, just multiply this result by k.

Q13. Answer: (b) B

According to the given information,

1) C, at one of the corners, was immediately next to both B and Y.

2) Z was immediately next to both B and X.

3) One of the center of sides was empty.

4) A was at the immediate right of X.

=> Case 1 gets eliminated.

Here, we can see that B is third to the right of W.

Hence, the correct answer is "B".

Q14. Answer: (a) F

The correct answer is option(1).

Key Points

• Valence electrons are electrons in the outermost shell (energy level) of an atom.

• According to this fluorine has 7 electrons in its outermost shell.

• These electrons can participate in the formation of chemical bonds if the outermost shell is not closed.

• In a single covalent bond, both atoms contribute one valence electron to form a shared pair.

• The presence of valence electrons determines an element’s chemical properties, including its valency (how readily it bonds with other elements) and the number of bonds it can form.

• An atom with a closed shell of valence electrons, corresponding to a noble gas configuration, tends to be chemically inert.

Additional Information

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• Valence electrons are crucial for understanding bonding, molecular geometry, and chemical reactions.
• They determine whether an element forms ionic bonds, covalent bonds, or participates in metallic bonding.
• Elements in the same group (column) of the periodic table have similar valence electron configurations and exhibit similar chemical behavior.
• Valence electrons impact material properties, such as electrical conductivity and hardness.
• Understanding valence electrons helps predict chemical reactions and design new materials.

Q15. Answer: (b) Right hand thumb rule

The correct answer is Right hand thumb rule.

Key Points

• The direction of a magnetic field due to a straight current-carrying conductor can be determined using the Right-hand thumb rule.
• The Right-hand thumb rule states that if you hold the current-carrying conductor with your right hand such that the thumb points in the direction of the current, then the fingers wrapped around the conductor will point in the direction of the magnetic field lines.
• This rule is a practical way to determine the orientation of the magnetic field generated by electric current in a straight conductor.
• The magnetic field forms concentric circles around the conductor with the direction given by the right-hand thumb rule.

Additional Information

• Fleming's left-hand rule is used to determine the direction of force on a current-carrying conductor in a magnetic field.
• Fleming's right-hand rule is used to determine the direction of induced current when a conductor moves in a magnetic field.
• The Left hand thumb rule is not commonly used in the context of magnetic fields and current-carrying conductors.
• Understanding these rules is crucial for students and professionals working with electromagnetism and related fields.

Q16. Answer: (c) The number of graduates who are also coffee lovers but not soldiers is 65.

The given venn diagram is shown below:

Let's check each option:

1) The number of soldiers who are neither coffee lovers nor graduates is 193 → False (The correct number of soldiers here is 141).

2) The number of soldiers who are also coffee lovers is 27 → False (The correct number of soldiers here is 90).

3) The number of graduates who are also coffee lovers but not soldiers are 65 → True

4) The number of coffee lovers who are both graduates and soldiers are 90 → False (The correct number here is 52).

Hence, the correct answer is "The number of graduates who are also coffee lovers but not soldiers is 65".

Q17. Answer: (c) 73/19 days

Shortcut Trick

Remaining work in terms of men-days = 51 men × (12 − 4) days = 51 × 8 men-days.

New total number of men = 51 + 6 = 57 men.

Required days = (Remaining work) ÷ (Total men) = (51 × 8) ÷ 57.

Required days = 408 ÷ 57 = 136 ÷ 19 = 7⅗19 days.

Therefore The correct answer is 7⅗19 days.

Alternate Method

Given: Initial men (M1) = 51, Days (D1) = 12, Days worked = 4, Joined men = 6.

Formula Used: M1D1 = M2D2 (for remaining work)

=> Total work units = 51 × 12 = 612 units

=> Work completed in 4 days = 51 × 4 = 204 units

=> Remaining work = 612 − 204 = 408 units

=> New strength (M2) = 51 + 6 = 57 men

=> Days required (D2) = Remaining work ÷ M2

=> D2 = 408 ÷ 57 = 136 ÷ 19

=> D2 = 7⅗19 days

Therefore The correct answer is 7⅗19 days.

Additional Information

Chain Rule Formula

The relationship between men, days, hours, and work is given by (M1D1H1)/W1 = (M2D2H2)/W2.

Inverse Proportion in Time & Work

The number of men is inversely proportional to the time taken to complete the same work. If men increase, days decrease.

Remaining Work Approach

Always calculate the work left after initial days as M1 × (Total Days − Days Spent) to simplify calculations.

Q18. Answer: (a) 150

Shortcut Trick

Identify the first prime number after 50 → 53.

Identify the last prime number before or at 100 → 97.

Sum = 53 + 97 = 150.

Therefore The correct answer is 150.

Alternate Method

Given: Number range = 51 to 100.

Smallest prime number in the range:

=> 51 is divisible by 3 (5+1=6).

=> 52 is even.

=> 53 is a prime number.

Greatest prime number in the range:

=> 100, 99, 98 are composite.

=> 97 is a prime number.

Calculation:

=> Sum = 53 + 97

=> Sum = 150

Therefore The correct answer is 150.

Additional Information

Prime Numbers (1-100)

There are exactly 25 prime numbers between 1 and 100. For the range 51-100, there are 10 primes: 53, 59, 61, 67, 71, 73, 79, 83, 89, 97.

Primality Test

To check if N is prime, test divisibility by primes up to √N. For 97, √97 ≈ 9.8, so test 2, 3, 5, 7. Since none divide 97, it is prime.

Q19. Answer: (b) 288°

Angle traced by the minute hand in 60 minutes → 360°

Angle traced by the minute hand in 1 minute = 360/60 = 6°

Angle traced by the minute hand in 48 minutes = 6 × 48 = 288°

Hence, the correct answer is "288°".

Q20. Answer: (c) 1285

The logic followed here is:

Hence, the correct answer is "1285".

Q21. Answer: (c) paper

The correct answer is paper.

Key Points

• Paper is a biodegradable and recyclable material, making it an eco-friendly option for carry bags.

• Unlike plastic, paper decomposes naturally and does not contribute to long-term environmental pollution.

• Using paper bags helps reduce the dependency on plastic, which is harmful to wildlife and ecosystems.

• Paper bags can be produced from recycled materials, further enhancing their eco-friendly credentials.

Additional Information

• Plastic pollution is a significant environmental issue, with millions of tons of plastic waste entering the oceans each year.

• Governments and organizations worldwide are encouraging the use of alternative materials like paper to combat plastic pollution.

• Paper bags can be reused multiple times if handled properly, increasing their utility and reducing waste.

• It's important to source paper from sustainably managed forests to ensure that the production of paper bags is environmentally responsible.

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Q22. Answer: (b) Netaji Subhash Chandra Bose

The correct answer is Netaji Subhash Chandra Bose

Key Points

• Parakram Divas is celebrated every year on January 23rd to commemorate the birth anniversary of Netaji Subhash Chandra Bose.

• Netaji Subhash Chandra Bose was a prominent Indian nationalist whose defiant patriotism made him a hero in India.

• He played a crucial role in India's independence movement and was known for his leadership of the Indian National Army (INA).

• The day was announced by the Government of India in 2021 to inspire people, especially the youth, to act with courage in the face of adversity as exemplified by Netaji's life and legacy.

Additional Information

• Netaji Subhash Chandra Bose was born on January 23, 1897, in Cuttack, Odisha.

• He was a key figure in the Indian independence movement and is remembered for his slogan "Give me blood, and I shall give you freedom!"

• Netaji formed the Azad Hind Fauj (Indian National Army) in 1942 to fight against British rule with the help of Axis powers during World War II.

• His efforts and vision continue to inspire generations of Indians.

• The celebration of Parakram Divas aims to honor his contributions and instill a sense of patriotism and bravery among the citizens.

Q23. Answer: (b) F > O > C > Li

The correct answer is option 2

Key Points

• The correct order of elements according to their valence shell electrons is F > O > C > Li.

• Fluorine (F) has 7 valence electrons, Oxygen (O) has 6, Carbon (C) has 4, and Lithium (Li) has 1.

• Valence electrons are the outermost electrons of an atom and are crucial in determining the chemical behavior of the element.

• Elements in the same group of the periodic table have the same number of valence electrons.

Additional Information

• The Periodic Table is a tabular arrangement of chemical elements, organized on the basis of their atomic number, electron configurations, and recurring chemical properties.

• Elements are presented in order of increasing atomic number.

• The rows of the table are called periods, and the columns are called groups.

• Elements with similar properties fall into the same columns (groups) of the periodic table.

• The concept of valence electrons is fundamental to understanding chemical bonding.

Q24. Answer: (b) baking powder

The correct answer is baking powder

Key Points

• Baking powder is commonly used to cook some foods faster.

• It acts as a leavening agent, releasing carbon dioxide when it reacts with moisture and heat, which helps the food rise and cook more quickly.

• It is widely used in baking recipes such as cakes, muffins, and bread.

• Unlike baking soda, baking powder contains both an acid and a base, which allows it to produce gas bubbles on its own when combined with liquid.

• Using baking powder can significantly reduce cooking time and improve the texture of baked goods.

Additional Information

• Sodium chloride, commonly known as table salt, is primarily used for seasoning and preserving food but does not significantly impact cooking time.

• Bleaching powder and ammonium chloride are not used in cooking and can be harmful if ingested.

• Baking powder should be stored in a cool, dry place to maintain its effectiveness.

• Always check the expiration date on baking powder as it can lose its potency over time, leading to less effective leavening.

Q25. Answer: (d) (x + 1) (x + 6) = 0

Shortcut Trick

Identify two numbers that multiply to 6 and add to 7.

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The pair (6, 1) satisfies: 6 × 1 = 6 and 6 + 1 = 7.

Directly write the factored form using these values: (x + 6)(x + 1) = 0.

Therefore The correct answer is (x + 1) (x + 6) = 0.

Alternate Method

Given Equation: $x^2 + 7x + 6 = 0$

Method Used: Splitting the middle term (Factorization).

$\Rightarrow x^2 + 6x + x + 6 = 0$

$\Rightarrow x(x + 6) + 1(x + 6) = 0$

$\Rightarrow (x + 6)(x + 1) = 0$

$\Rightarrow (x + 1)(x + 6) = 0$

Therefore The correct answer is (x + 1) (x + 6) = 0.

Additional Information

Standard Quadratic Form

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

Factor Theorem

If p is a root of the equation f(x) = 0, then (x − p) is a factor of the polynomial f(x).

Sum and Product of Roots

For $x^2 + bx + c = 0$, the sum of roots is −b and the product of roots is c.

Discriminant

The value $D = b^2 − 4ac$ determines the nature of the roots (real, equal, or imaginary).

Q26. Answer: (c) Uttar Pradesh

The correct answer is Uttar Pradesh

Key Points

• In April 2022, the Lok Sabha passed the Constitution (Scheduled Castes and Scheduled Tribes) Orders (Second Amendment) Bill, 2022.

• The Bill seeks to amend the Constitution to include Gonds and associated tribes in the Scheduled Tribes category.

• This inclusion is specific to certain districts of Uttar Pradesh.

• The amendment aims to ensure that these communities receive the benefits and protections accorded to Scheduled Tribes.

Additional Information

• The Constitution of India provides for the classification of certain communities as Scheduled Castes and Scheduled Tribes under Articles 341 and 342, respectively.

• These classifications are intended to provide social, economic, and educational support to historically disadvantaged groups.

• Periodic amendments to these classifications ensure that emerging needs and demographic changes are addressed.

• Gonds are one of the largest tribal groups in India, predominantly found in central India.

• Inclusion in the Scheduled Tribes category enables access to reservations in education, employment, and political representation.

Q27. Answer: (d) Gradation

The correct answer is Gradation

Key Points

• Gradation is the phenomenon of wearing down of relief variations of the surface of the Earth through erosion.

• It involves the leveling of the Earth's surface by the processes of weathering, erosion, and deposition.

• Gradation can result in the reduction of highlands and the filling up of depressions, leading to a more uniform landscape.

• This process is essential in shaping the topography of the Earth over geological time scales.

Additional Information

• Erosion is a key component of gradation, involving the removal of soil, rock, or dissolved material from one location on the Earth's crust and its transport to another location.

• The agents of erosion include water, wind, ice, and gravity.

• Weathering is the process that breaks down rocks and minerals into smaller particles through mechanical, chemical, and biological means.

• Deposition occurs when the transported materials are eventually laid down or deposited, often in new locations such as river deltas, beaches, or sand dunes.

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• The combined effect of these processes leads to the gradual leveling of the Earth's surface, contributing to the dynamic nature of the planet's topography.

Q28. Answer: (b) Koyla Darpan

The correct answer is Koyla Darpan

Key Points

• The Government of India launched the Koyla Darpan portal in January 2022.

• The portal is designed to share key performance indicators of the coal sector.

• It aims to provide transparency and better governance in the coal sector by making important data accessible to the public.

• The portal includes information on production, dispatch, infrastructure projects, and other relevant metrics.

Additional Information

• The coal sector is vital for India's energy security and economic growth.

• India is one of the largest producers and consumers of coal in the world.

• Efforts are being made to improve efficiency and reduce environmental impact in the coal sector.

• The government has also been focusing on diversification of energy sources, including renewable energy, to ensure sustainable development.

Q29. Answer: (c) $2x^2 + 9x - 3$

Shortcut Trick

Expand the expression by parts: $3(3x - 2) = 9x - 6$.

Simplify the fraction term: $x(4x \div 2) = 2x^2$.

Perform constant calculations: $15 - 12 = 3$.

Summing all parts: $2x^2 + 9x - 6 + 3 = 2x^2 + 9x - 3$.

Therefore The correct answer is $2x^2 + 9x - 3$.

Alternate Method

Given Expression: $3(3x - 2) + x(4x \div 2) + 15 - 12$

Method Used: BODMAS Rule and Distributive Property of Multiplication.

=> Step 1: Open the bracket using Distributive Property.

=> $3 \times 3x - 3 \times 2 = 9x - 6$

=> Step 2: Simplify the term involving Division and Algebraic Multiplication.

=> $x(4x \div 2) = x(2x) = 2x^2$

=> Step 3: Combine the constant terms.

=> $15 - 12 = 3$

=> Step 4: Combine all the simplified components together.

=> $(9x - 6) + (2x^2) + 3$

=> Rearranging the terms in descending order of power:

=> $2x^2 + 9x - 6 + 3$

=> $2x^2 + 9x - 3$

Therefore The correct answer is $2x^2 + 9x - 3$.

Additional Information

BODMAS Rule

It stands for Bracket, Of, Division, Multiplication, Addition, and Subtraction. It defines the order of operations to solve complex mathematical expressions.

Distributive Property

The Distributive Property states that $a(b + c) = ab + ac$ and $a(b - c) = ab - ac$, allowing us to multiply a single term by a sum inside a bracket.

Laws of Indices

When multiplying Algebraic Terms with the same base, the Exponents are added: x^a × x^b = x^(a+b). For example, $x^1 \times x^1 = x^2$.

Like Terms

Only Like Terms (terms having the same variables with the same powers) can be added or subtracted to simplify a polynomial expression.

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Q30. Answer: (d) 8

Only two are wearing red coloured T-shirts. => Number of players = 2

Exactly three are wearing yellow-coloured T-shirts. => Number of players = 3

Player in saffron coloured T-shirt = 1

Player in White coloured T-shirt = 1

Player in Green coloured T-shirt = 1

So, total players are playing football on the ground = (2 + 3 + 1 + 1 + 1) = 8

Hence, the correct answer is "8".

Q31. Answer: (a) He worked with a small sample size.

The correct answer is He worked with a small sample size.

Key Points

• Mendel's success can be attributed to several factors, but working with a small sample size is not one of them.

• He kept a count of individuals of a particular trait in each generation, which was crucial for analyzing inheritance patterns.

• He studied the inheritance of one character at a time, unlike his predecessors who considered the organism as a whole.

• He effectively blended his knowledge of Science and Mathematics to analyze his data and formulate the laws of inheritance.

Additional Information

• Mendel's meticulous approach to experimentation and data collection set the foundation for modern genetics.

• His use of large sample sizes allowed for more accurate and reliable results, leading to the formulation of the laws of inheritance.

• Despite initial resistance, Mendel's work was later recognized as groundbreaking and foundational in the field of genetics.

Q32. Answer: (d) (49, 63, 9)

The logic followed here is:

Logic: Second number = √First number × Third number

(36, 78, 13)

→ 78 = √36 × 13

→ 78 = 6 × 13

(121, 77, 7)

→ 77 = √121 × 7

→ 77 = 11 × 7

Let's check each option,

1) (36, 72, 10)

→ 72 = √36 × 10

→ 72 ≠ 6 × 10

2) (64, 85, 12)

→ 85 = √64 × 12

→ 85 ≠ 8 × 12

3) (9, 56, 18)

→ 56 = √9 × 18

→ 56 ≠ 3 × 18

4) (49, 63, 9)

→ 63 = √49 × 9

→ 63 = 7 × 9 => Follows the logic.

Hence, the correct answer is "(49, 63, 9)".

Q33. Answer: (a) 38/9

Given:

Repeating decimal: 4.2222...

Formula Used:

To convert a repeating decimal to a fraction, use the formula:

Decimal = P/Q where P and Q are integers.

Calculation:

Let x be the repeating decimal:

x = 4.2222...
Multiply both sides by 10 to shift the decimal point:
10x = 42.2222...
Now, subtract the original equation from this new equation:
10x - x = 42.2222... - 4.2222...
=> 9x = 38
x = 38/9
Therefore The correct answer is 38/9.

Q34. Answer: (d) 96 sq. units

Shortcut Trick
Identify the Pythagorean triplet where the difference between the hypotenuse and the two sides matches 4 and 8.
Consider the triplet (12, 16, 20).
Check differences: 20 − 16 = 4 and 20 − 12 = 8. (Conditions satisfied)
Area = 1/2 × Base × Height = 1/2 × 12 × 16 = 96 sq. units.
Therefore The correct answer is 96 sq. units.
Alternate Method
Given:
Let the hypotenuse be h units.
Side 1 (a) = h − 4 units
Side 2 (b) = h − 8 units
Formula Used:
Pythagoras Theorem: $a^2 + b^2 = h^2$
Area = 1/2 × a × b
=> $(h − 4)^2 + (h − 8)^2 = h^2$
=> $h^2 − 8h + 16 + h^2 − 16h + 64 = h^2$
=> $h^2 − 24h + 80 = 0$
=> $(h − 20)(h − 4) = 0$
=> h = 20 or h = 4 (h = 4 is not possible as b would be 4 − 8 = −4)
=> h = 20 units
=> a = 20 − 4 = 16 units; b = 20 − 8 = 12 units
=> Area = 1/2 × 16 × 12 = 96 sq. units
Therefore The correct answer is 96 sq. units.
Additional Information
Pythagorean Triplets
Sets of three integers (a, b, c) that satisfy $a^2 + b^2 = c^2$, such as (3, 4, 5), (5, 12, 13), and (8, 15, 17).
Area of Triangle
The general formula is Area = 1/2 × Base × Height. For a right-angled triangle, the legs serve as base and height.
Circumradius of Right Triangle
The circumradius (R) of a right-angled triangle is equal to half of the hypotenuse (R = h/2).

Q35. Answer: (c) Rs. 31

Shortcut Trick
Sum of items: 8 pencils + 8 pens = Rs. 81 + Rs. 71 = Rs. 152
=> 1 pencil + 1 pen = 152 ÷ 8 = Rs. 19
Difference: 2 pencils − 2 pens = 71 − 81 = −10 => 1 pen − 1 pencil = Rs. 5
By adding results: 2 pens = Rs. 19 + Rs. 5 = Rs. 24 => 1 pen = Rs. 12
Cost of 1 pencil = 19 − 12 = Rs. 7; Required: 7 + (2 × 12) = Rs. 31
Therefore The correct answer is Rs. 31.
Alternate Method
Given:
Cost of 3 pencils and 5 pens = Rs. 81

Cost of 5 pencils and 3 pens = Rs. 71

Let the cost of one pencil be Rs. x and one pen be Rs. y.

=> 3x + 5y = 81 --- (Equation 1)

=> 5x + 3y = 71 --- (Equation 2)

Adding Equation 1 and 2:

=> 8x + 8y = 152

=> x + y = 19 --- (Equation 3)

Subtracting Equation 2 from 1:

=> −2x + 2y = 10 => y − x = 5 --- (Equation 4)

Solving Equation 3 and 4:

=> (x + y) + (y − x) = 19 + 5

=> 2y = 24 => y = 12

=> x = 19 − 12 = 7

Total cost of 1 pencil and 2 pens:

=> x + 2y = 7 + (2 × 12)

=> 7 + 24 = 31

Therefore The correct answer is Rs. 31.

Additional Information

Linear Equations with Swapped Coefficients

For equations of type ax + by = m and bx + ay = n, always add and subtract them first to find simpler values of (x + y) and (x − y).

Elimination Method

Multiply equations by suitable constants to make the coefficients of one variable equal, then add or subtract to eliminate it.

Unitary Method for Prices

Always find the price of a single unit (1 pencil, 1 pen) before calculating the price of multiple combined units.

Q36. Answer: (a) 0°

The correct answer is 0°

Key Points

• 0° is the angle of reflection when the light ray is incident normally (perpendicularly) to the surface of the mirror.

• According to the law of reflection, the angle of incidence is equal to the angle of reflection.

• In this case, since the light ray is incident normally, the angle of incidence is 0°, and thus the angle of reflection is also 0°.

• Convex mirrors reflect light rays outwards, but the law of reflection still applies.

• The reflected ray will retrace the path of the incident ray in this scenario.

Additional Information

• Convex mirrors are used in various applications such as vehicle side mirrors and security mirrors because they provide a wider field of view.

• The focal point of a convex mirror is virtual and located behind the mirror.

• Convex mirrors always form virtual, erect, and diminished images irrespective of the position of the object.

• They follow the mirror formula and magnification formula similar to concave mirrors but with a negative focal length.

• In practical applications, convex mirrors help in reducing blind spots and enhancing safety.

Q37. Answer: (d) 45

The number of doctors who are also joggers but not NRIs is shown below:

Hence, the correct answer is "45".

Q38. Answer: (b) C7H14

The correct answer is C7H14.

Key Points

• The given compound is propene (C3H6), which is an alkene.

• A homologous series is a sequence of compounds where each member differs from the next by a CH2 group.

• We need to find the fourth next member of the homologous series.

• For alkenes, the general formula is CnH2n.

Steps and Solution

• Start from propene (as propane in alkenes):
• Propene (C3H6)
• Next members in the alkene series:
• Butene (C4H8)
• Pentene (C5H10)
• Hexene (C6H12)
• Heptene (C7H14)
• Therefore, the fourth next member after propene (C3H6) in the alkene series is heptene (C7H14).

The correct answer is C7H14.

Q39. Answer: (a) Viruses

The correct answer is Viruses

Key Points

• The Cell Theory, formulated by Schleiden and Schwann, states that all living organisms are composed of cells, and the cell is the basic unit of life.
• However, viruses are an exception to this theory as they are not made up of cells.
• Viruses consist of genetic material (DNA or RNA) enclosed in a protein coat and lack the cellular structure necessary for metabolic processes.
• They can only replicate inside the living cells of a host organism, making them unique compared to cellular life forms.

Additional Information

• Fungi, animals, and algae are all composed of cells and hence follow the principles of the Cell Theory.
• Schleiden and Schwann's Cell Theory was a groundbreaking discovery in the field of biology that helped to lay the foundation for modern cell biology.
• The Cell Theory also includes the concepts that all cells arise from pre-existing cells and that the cell is the fundamental unit of structure and function in all living organisms.

Q40. Answer: (d) 3

According to the given information,

Letters	A	C	Q	U	I	R	E
In alphabetical order	A	C	E	I	Q	R	U

Here, we can see that there are 3 letters which remains unchanged.

Hence, the correct answer is "3".

Q41. Answer: (d) 6

The correct answer is 6

Key Points

• 6 languages have been granted the status of 'classical language' in India as of June 2022.
• The criteria for declaring a language as 'classical' include its ancient history, rich heritage, and independent tradition.
• The languages that have been designated as classical are Tamil, Sanskrit, Kannada, Telugu, Malayalam, and Odia.
• This status helps in preserving and promoting the rich cultural heritage associated with these languages.

Additional Information

• Tamil was the first to be declared as a classical language in 2004.
• Sanskrit followed in 2005, emphasizing its ancient literary tradition.
• Kannada and Telugu were both recognized in 2008.
• Malayalam was granted the status in 2013.
• Odia was the latest addition in 2014.
• This status allows these languages to receive financial assistance for research, scholarships, and promotion activities.

Q42. Answer: (c) Y H V A M

The given numbers/symbols to be coded is: 6 < % 2 #

Number/Symbol	6	<	%	2	#

Code	M	H	V	A	Y

Here, the first condition will be applied as the first element is a number and the last a symbol, thus the codes for these two are to be interchanged,

Thus, the final code we get is "Y H V A M".

Hence, the correct answer is "Y H V A M".

Q43. Answer: (d) Psychological

The correct answer is Psychological

Key Points

• The aspect of large dams that has NOT been criticised is Psychological.

• Large dams have faced criticism on various fronts including economic, social, and environmental aspects.

• Critics argue that large dams can lead to displacement of communities, environmental degradation, and economic burdens due to high costs and maintenance.

• While there are various criticisms, the psychological aspect has not been a major point of contention in the discourse surrounding large dams.

Additional Information

• Large dams often require significant financial investment and can impact local economies both positively and negatively.

• The social impact includes the displacement of communities and changes in local livelihoods.

• The environmental impact includes changes in ecosystems, loss of biodiversity, and alteration of natural water courses.

• Overall, while large dams have been a subject of extensive debate, the psychological impact has not emerged as a primary criticism.

Q44. Answer: (d) 8

The given number is: 53478231

If 1 is added to each odd digit and 2 is subtracted from each even digit in the number 53478231 → 6 4 2 8 6 0 4 2

Second from the left → 4

Second from the right → 4

Sum of the digits that are second from the left and second from the right: 4 + 4 = 8

Hence, the correct answer is "8".

Q45. Answer: (d) PV Sindhu

The correct answer is PV Sindhu

Key Points

• PV Sindhu was the Team India Flag Bearer at the 2022 Commonwealth Games opening ceremony in Birmingham.

• The Commonwealth Games is a multi-sport event held every four years involving athletes from the Commonwealth of Nations.

• The opening ceremony is a significant event where the flag bearers of each participating nation lead their athletes into the stadium.

• PV Sindhu is a renowned Indian badminton player who has won medals in various international competitions, including the Olympics and World Championships.

Additional Information

• PV Sindhu has been a prominent figure in Indian sports, inspiring many young athletes across the country.

• The Commonwealth Games 2022 were held in Birmingham, England, from 28 July to 8 August 2022.

• India has participated in the Commonwealth Games since 1934 and has been a consistent performer in various sports.

• The role of the flag bearer is a prestigious honor given to an athlete who has made significant contributions to their sport and country.

• PV Sindhu's selection as the flag bearer highlights her achievements and the respect she commands in the Indian sports community.

Q46. Answer: (b) length of the conductor

The correct answer is length of the conductor

Key Points

• Resistance of a conductor is directly proportional to the length of the conductor.

• The relationship can be expressed as R prop. to L, where R is the resistance and L is the length of the conductor.

• As the length of the conductor increases, the resistance increases because the electrons have to travel a longer distance, facing

more collisions.

• This principle is fundamental in the design of electrical circuits and materials.

Additional Information

• Ohm's Law states that the resistance of a conductor is also influenced by its material and temperature.

• The resistivity of a material is a measure of how strongly it resists the flow of electric current.

• The cross-sectional area of a conductor inversely affects its resistance; as the area increases, the resistance decreases.

• The formula for resistance in terms of length and cross-sectional area is given by R = ρ(L/A), where ρ (rho) is the resistivity of the material.

Q47. Answer: (d) 14

According to the given information,

1) M is sitting at the extreme left end. K is to the immediate right of M. G is to the immediate right of K.

2) Only five persons are sitting between G and D.

3) D is at the 6th position from the extreme right end. G is at some place towards the left of D.

Here, we can see that there are 14 persons seated in the row.

Hence, the correct answer is "14".

Q48. Answer: (b) Rs. 7,777

Shortcut Trick

Given Profit% = 10% and Profit Value = Rs. 777.70.

Using ratio method: 10% = 1/10, where 1 unit is Profit and 10 units is CP.

1 unit => 777.70

10 units (CP) => 777.70 × 10 = 7,777.

Therefore The correct answer is Rs. 7,777.

Alternate Method

Given: Profit = Rs. 777.70, Profit Percentage = 10%

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

=> 10% of Cost Price (CP) = 777.70

=> (10 ÷ 100) × CP = 777.70

=> 0.1 × CP = 777.70

=> CP = 777.70 ÷ 0.1

=> CP = 7,777

Therefore The correct answer is Rs. 7,777.

Additional Information

Cost Price (CP)

The price at which an article is purchased. CP = SP − Profit or CP = SP + Loss.

Profit Percentage

Profit calculated as a percentage of the Cost Price. Profit% = (Profit ÷ CP) × 100.

Q49. Answer: (c) Himmat

According to the given information,

1) Prateek sits second to the left of Kartik.

2) Kartik sits to the immediate left of Nihit.

3) Dev is sitting at one of the extreme ends.

4) Only Prateek is sitting between Yash and Himmat.

5) Himmat sits third to the right of Dev.

Here, we can see that Himmat is sitting to the immediate left of Kartik.

Hence, the correct answer is "Himmat".

Q50. Answer: (b) 59

The logic followed here is:

Hence, the correct answer is "59".

Q51. Answer: (b) Both (i) and (ii)

The correct answer is Both (i) and (ii).

Key Points

• The heating effect of electric current is the phenomenon where an electric current passing through a conductor produces heat. This effect is utilized in various electrical devices to generate heat for specific purposes.

• Incandescent Lamp: An incandescent lamp produces light by heating a filament inside the bulb to a high temperature using electric current. The filament emits light as it heats up, thus utilizing the heating effect of electric current.

• Electric Geyser: An electric geyser heats water by passing electric current through a heating element. The heating element converts electrical energy into heat energy, which warms the water, making use of the heating effect of electric current.

• Electric Generator: An electric generator converts mechanical energy into electrical energy. It does not rely on the heating effect of electric current for its primary function. Instead, it operates based on electromagnetic induction.

• Therefore, both the incandescent lamp and the electric geyser are based on the heating effect of electric current, while the electric generator is not.

Q52. Answer: (d) 81

Shortcut Trick

Ratio of numbers = 5 : 3

Difference in ratio units = 5 − 3 = 2 units

Given Actual Difference = 54

=> 2 units = 54 → 1 unit = 27

Smaller number = 3 units = 3 × 27 = 81

Therefore The correct answer is 81.

Alternate Method

Given:

Ratio of two numbers = 5 : 3

Difference = 54

Calculation:

Let the numbers be 5x and 3x.

=> 5x − 3x = 54

=> 2x = 54

=> x = 54 ÷ 2

=> x = 27

=> Smaller number = 3x = 3 × 27 = 81

Therefore The correct answer is 81.

Additional Information

Ratio and Proportion

A ratio compares two quantities. If a : b is the ratio, the numbers are ax and bx where x is the common constant of proportionality.

Sum of Numbers

If the sum is required instead of the difference, use (a + b)x. Here, sum = (5 + 3) × 27 = 8 × 27 = 216.

Q53. Answer: (c) Madhya Pradesh

The correct answer is Madhya Pradesh

Key Points

• Madhya Pradesh presented the 'Children's Budget' for the first time in March 2022.

• This initiative was part of the state's annual financial plan.

• The 'Children's Budget' aims to allocate resources specifically for child-centric schemes and projects.

• It is a significant step towards prioritizing the welfare and development of children in the state.

Additional Information

• Madhya Pradesh is known for taking progressive steps in various sectors, including education and healthcare.

• The state government has been focusing on enhancing the quality of life for its younger population through various initiatives.

• The introduction of the 'Children's Budget' reflects the state's commitment to ensuring better opportunities and a brighter future for its children.

Q54. Answer: (b) 95 m, West

According to the given information,

1) Jaya walks 100 m towards the north.

2) She then takes a right turn and walks 45 m.

3) She then takes right turn and walks 175 m.

4) She then takes a left turn and walks 50 m.

5) She then takes a left turn and walks 75 m to reach a tea stall.

Here, we can see that the shop is 95 m in the west direction from the tea stall.

Hence, the correct answer is "95 m, West".

Q55. Answer: (d) 13

According to the given information,

1) Only one person sits between G and D. G is to the left of D.

2) H is fifth to the left of G.

3) K is to the immediate right of D. P is third to the right of K.

4) P is to the immediate left of Z.

Here, we can see the total number of persons sitting here is 13.

Hence, the correct answer is "13".

Q56. Answer: (c) NK Singh

The correct answer is NK Singh

Key Points

• NK Singh is the Chairman of the 15th Finance Commission of India as of July 2022.

• The Finance Commission is a constitutional body tasked with recommending measures and methods on how revenues need to be distributed between the centre and states.

• It also addresses issues related to the devolution of funds to local bodies in the states.

• The 15th Finance Commission was constituted in November 2017 and its recommendations cover the period from 2020 to 2025.

Additional Information

• The Finance Commission is established under Article 280 of the Indian Constitution.

• It is constituted by the President of India every five years.

• The primary function of the Finance Commission is to define the financial relations between the central government and the individual state governments.

• NK Singh has also served in various capacities including as a member of the Planning Commission and as a senior bureaucrat in the Government of India.

Q57. Answer: (b) Only conclusion 1 is true

Given statement is: C < D, E ≥ B, B > D

On combining we get: E ≥ B > D > C

Conclusions:

1. B > C => True (Because it has a definite relation; B > D > C)

2. E < D => False (Because it has a definite relation; E ≥ B > D)

Hence, the correct answer is "Only conclusion 1 is true".

Q58. Answer: (b) 40%

Shortcut Trick

In a Buy X Get Y Free offer, the discount is calculated on the total quantity (X + Y).

Discount% = (Free Items ÷ Total Items) × 100

Discount% = (2 ÷ (3 + 2)) × 100

Discount% = (2 ÷ 5) × 100 = 40%

Therefore The correct answer is 40%.

Alternate Method

Given: Buy 3 sarees, Get 2 free.

Formula: Discount% = (Total MP − Total SP) ÷ Total MP × 100

=> Let the Marked Price (MP) of 1 saree be Rs. 1.

=> Total sarees received by customer = 3 + 2 = 5.

=> Total MP of 5 sarees = Rs. 5.

=> Customer pays only for 3 sarees, so Selling Price (SP) = Rs. 3.

=> Discount = MP − SP = 5 − 3 = Rs. 2.

=> Discount% = (2 ÷ 5) × 100 = 40%.

Therefore The correct answer is 40%.

Additional Information

Marked Price & Discount

Discount is always calculated on the Marked Price (MP) unless otherwise specified. Discount = MP − SP.

Effective Discount

In "Buy X Get Y" schemes, the shopkeeper gives away (X+Y) items but charges for only X. The Effective Discount = [Y ÷ (X+Y)] × 100%.

Q59. Answer: (d) Swaran Singh Committee

The correct answer is Swaran Singh Committee

Key Points

• The Fundamental Duties were added to the Indian Constitution based on the recommendations of the Swaran Singh Committee.

• This committee was constituted by the Government of India during the Emergency period in 1976.

• The Fundamental Duties were incorporated into the Constitution by the 42nd Amendment Act of 1976.

• Initially, ten Fundamental Duties were added, which were later increased to eleven by the 86th Amendment Act in 2002.

• These duties are listed under Article 51A in Part IVA of the Constitution.

• The Fundamental Duties serve as a constant reminder to citizens of their responsibilities towards the nation and society.

Additional Information

• Article 51A lists the Fundamental Duties of every citizen of India.

• These duties include respecting the Constitution, promoting harmony, and protecting the sovereignty, unity, and integrity of India.

• They also encompass duties like protecting the environment, safeguarding public property, and striving towards excellence in all spheres of individual and collective activity.

• The Fundamental Duties, though non-justiciable, are crucial for the moral and ethical development of citizens.

• They complement the Fundamental Rights and Directive Principles of State Policy laid down in the Constitution.

Q60. Answer: (a) 12

Given:

The product of the roots of x2 - 7x + 12 = 0

Concept Used:

$ax^2 + bx + c = 0$

Product of the root = c/a

Solution:

x2 - 7x + 12 = 0

According to the concept,

x2 + (- 7)x + 12 = 0

Product of the root = 12/1 = 12

Therefore The product of the roots of x2 - 7x + 12 = 0 is 12.

Q61. Answer: (b) SUQAI

PTEJAD: OUEIAE

FHNOI: EIMOI

Similarly,

TUPAI: ?

Hence, the correct answer is "SUQAI".

Q62. Answer: (b) Part IX

The correct answer is Part IX

Key Points

• Part IX of the Indian Constitution deals with the Panchayati Raj system.

• It was added by the 73rd Constitutional Amendment Act of 1992.

• This part is titled "The Panchayats" and covers Articles from 243 to 243O.

• The amendment aimed to provide constitutional status to the Panchayati Raj institutions and ensure their regular elections, more powers, and financial autonomy.

• The Panchayati Raj system is a three-tier system of local self-government in rural India, comprising the Gram Panchayat (village level), Mandal Parishad or Block Samiti (block level), and Zila Parishad (district level).

Additional Information

• The 73rd Amendment also introduced the concept of Gram Sabhas, which are assemblies of the registered voters within the Panchayat area.

• It mandates the establishment of a State Election Commission for conducting elections to the Panchayats.

• The amendment also provides for the reservation of seats for Scheduled Castes, Scheduled Tribes, and women (not less than one-third of the seats) in Panchayati Raj institutions.

• It empowers the Panchayats to prepare and implement plans for economic development and social justice.

• The Panchayati Raj institutions are expected to act as instruments of local self-governance, bringing government closer to the grassroots level.

Q63. Answer: (d) A > E

Given statement is: A < B < C ≤ D = E > F > G

Let's check each option,

1) E > B → True (Because there is a definite relation; B < C ≤ D = E)

2) C ≤ E → True (Because there is a definite relation; C ≤ D = E)

3) D > G → True (Because there is a definite relation; D = E > F > G)

4) A > E → False (Because there is a definite relation; A < B < C ≤ D = E)

Here, we can see that option 4 is not true.

Hence, the correct answer is "A > E".

Q64. Answer: (c) fish

The correct answer is 3) fish

Key Points

• Double circulation refers to the separation of oxygenated and deoxygenated blood into two distinct circuits: the systemic and pulmonary circuits.

• Double circulation is observed in amphibians, reptiles, birds, and mammals.

• Fish have a single circulatory system where the blood passes through the heart only once during each complete circuit of the body.

• In fish, the heart pumps deoxygenated blood to the gills where it gets oxygenated and then directly flows to the rest of the body.

• This single circulation system is less efficient compared to the double circulation system found in other vertebrates.

Additional Information

• In frogs (amphibians), eagles (birds), and snakes (reptiles), double circulation can be observed where the heart has separate chambers to handle oxygenated and deoxygenated blood.

• Double circulation helps in maintaining a higher blood pressure and efficient oxygen delivery to tissues, which is essential for the higher metabolic demands of these animals.

• The efficiency of double circulation is a key factor in the success of higher vertebrates in diverse environments.

Q65. Answer: (b) NXOQ

FAST : JDUU

SLOW : WOQX

Similarly,

JUMP : ?

Hence, the correct answer is "NXOQ".

Q66. Answer: (d) Both the statements are true.

The correct answer is Both the statements are true.

Key PointsChemical Reactions Involving Copper:

• Statement-I: When copper powder is heated in the presence of oxygen, it reacts to form black copper (II) oxide (CuO). This is a

typical oxidation reaction where copper (Cu) reacts with oxygen (O_2) to form copper oxide (CuO).

• The chemical equation for this reaction is:

$2Cu + O_2 \rightarrow 2CuO$

• Statement-II: When hydrogen gas is passed over heated copper (II) oxide (CuO), a reduction reaction occurs. The black copper (II) oxide is reduced to brown copper metal (Cu), and water (H_2O) is formed.

• The chemical equation for this reaction is:

$CuO + H_2 \rightarrow Cu + H_2O$

• Hence, both statements are true.

Q67. Answer: (c) Both (i) and (iii)

The correct answer is 3 Both (i) and (iii).

Key Points

• DC Motor Characteristics:

• The function of the split rings (commutator) in a DC motor is to reverse the flow of current through the coil every half rotation. This ensures that the torque acting on the coil is always in the same direction, which helps in continuous rotation. Hence, Statement (i) is correct.

• The arms of the coil experience maximum force when they are perpendicular to the magnetic field. When the arms are parallel to the magnetic field, the force experienced is zero. Hence, Statement (ii) is not correct.

• Reversing the current after every half rotation indeed leads to the continuous rotation of the coil in a DC motor. This is due to the action of the commutator. Hence, Statement (iii) is correct.

Q68. Answer: (d) 48

Shortcut Trick

Mean Proportional is the geometric mean of two numbers.

Direct Calculation → $\sqrt{(16 \times 144)} = 4 \times 12 = 48$.

Therefore The correct answer is 48.

Alternate Method

Given: First number (a) = 16, Second number (b) = 144.

Formula Used: Mean proportional (x) between a and b is $x = \sqrt{(a \times b)}$.

$\Rightarrow x = \sqrt{(16 \times 144)}$

$\Rightarrow x = \sqrt{16} \times \sqrt{144}$

$\Rightarrow x = 4 \times 12$

$\Rightarrow x = 48$

Therefore The correct answer is 48.

Additional Information

Third Proportional

For two numbers a and b, the third proportional (c) is calculated as $c = b^2/a$.

Fourth Proportional

For three numbers a, b, and c, the fourth proportional (d) is calculated as $d = (b \times c)/a$.

Compound Ratio

The compound ratio of a:b and c:d is $(a \times c) : (b \times d)$.

Q69. Answer: (c) 50 cm

The correct answer is 50 cm.

Key Points

• The combination of a convex lens and concave lens results in the net power being the sum of individual powers.

• The total power of the combination is $P_{(total)}=P1+P2=5\ D + (-3\ D) = 2\ D$.

• The focal length of a lens is given by $f = 1 / P$, where P is the power of the lens.

• For the combination, the focal length will be $1 / 2\ D = 0.5\ m = 50\ cm$.

Additional Information

• Convex lenses are also known as converging lenses because they converge light rays to a point.

• Concave lenses are known as diverging lenses because they spread out light rays.

• In optics, the power of a lens is a measure of its ability to bend light and is measured in diopters (D).

• The combination of lenses is useful in various optical instruments to achieve the desired magnification and focal properties.

• Understanding the properties of lens combinations is critical in fields such as photography, astronomy, and vision correction.

Q70. Answer: (b) Argument I weakens, while argument II strengthens the statement

The correct answer is option 2.

Key Points

• The given statement is: Last year, only 30 percent of girl students in district X joined under-graduate courses after school, while 95 percent boys joined under-graduate courses.

• Arguments:

• I. The state government has increased the number of scholarships for girl students in undergraduate courses in government colleges → This weakens the statement as if the government would have provided scholarships, a greater number of girls would have joined the undergraduate courses.

• II. Many girl students prefer to join vocational courses after school rather than undergraduate courses → This strengthens the statement as only 30 percent of girl students joined under-graduate courses after school, they would have joined vocational courses.

• Hence, the correct answer is "Argument I weakens, while argument II strengthens the statement".

Q71. Answer: (b) All the conclusions follow

The least possible venn diagram is shown below:

Conclusions:

I. Some boards are desks → True (Because all desks are chalks, and all chalks are boards).

II. Some chalks are chairs → True (Because all chairs are desks, and all desks are chalks).

III. Some boards are chairs → True (Because all chairs are desks, and all desks are boards).

Hence, the correct answer is "All the conclusions follow".

Q72. Answer: (d) 4

The given series is: 2 5 6 9 (8 0 3) (8 6 7) 2 5 2 2 (6 8 3) (6 5 3)

Here, we can see that there are four numbers which is immediately preceded by an even number and immediately followed by an odd number.

Hence, the correct answer is "4".

Q73. Answer: (c) Telangana

The correct answer is Telangana

Key Points

• Telangana has launched the 'Dalit Bandhu' welfare scheme in March 2022.

• This scheme aims to empower Dalit families in the state and promote entrepreneurship among them.

• The scheme provides a direct benefit transfer of Rs. 10 lakh per family to support their entrepreneurial ventures.

• The initiative is part of the state government's effort to uplift marginalized communities and ensure their economic development.

Additional Information

• Telangana's 'Dalit Bandhu' scheme is considered one of the largest direct benefit transfer schemes in India aimed at the empowerment of Dalits.

• The scheme is expected to cover numerous families and help them achieve financial independence.

• It is part of a broader strategy by the Telangana government to promote social equity and economic justice.

• The scheme also includes measures for ensuring the effective utilization of funds and providing necessary support and guidance to beneficiaries.

Q74. Answer: (c) DGS-43

The logic followed here is:

Hence, the correct answer is "DGS-43".

Q75. Answer: (b) 2

Shortcut Trick

For terms like $\sin^2\theta + \sin^2(90° - \theta) = 1$ and $\cos^2\theta + \cos^2(90° - \theta) = 1$.

Numerator: $(\sin^2 10 + \sin^2 80) + (\sin^2 20 + \sin^2 70) + (\sin^2 30 + \sin^2 60) + (\sin^2 40 + \sin^2 50) + \sin^2 90 = 1 + 1 + 1 + 1 + 1 = 5$.

Denominator: $(\cos^2 20 + \cos^2 70) + (\cos^2 40 + \cos^2 50) + \cos^2 45 = 1 + 1 + 0.5 = 2.5$.

Result = 5 ÷ 2.5 = 2.

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Therefore The correct answer is 2.

Alternate Method

Given: Expression involving squared trigonometric ratios of complementary angles.

Formula Used: $\sin^2A + \cos^2A = 1$; $\sin(90° - \theta) = \cos\theta$; $\cos(90° - \theta) = \sin\theta$.

=> Numerator = $\sin^2 10° + \sin^2 20° + \sin^2 30° + \sin^2 40° + \sin^2 50° + \sin^2 60° + \sin^2 70° + \sin^2 80° + \sin^2 90°$

=> Numerator = $(\sin^2 10° + \cos^2 10°) + (\sin^2 20° + \cos^2 20°) + (\sin^2 30° + \cos^2 30°) + (\sin^2 40° + \cos^2 40°) + 1^2$

=> Numerator = 1 + 1 + 1 + 1 + 1 = 5

=> Denominator = $\cos^2 20° + \cos^2 40° + \cos^2 50° + \cos^2 70° + \cos^2 45°$

=> Denominator = $(\cos^2 20° + \sin^2 20°) + (\cos^2 40° + \sin^2 40°) + (1/\sqrt{2})^2$

=> Denominator = 1 + 1 + 0.5 = 2.5

=> Final Value = 5 ÷ 2.5 = 2

Therefore The correct answer is 2.

Additional Information

Complementary Angle Identities

If A + B = 90°, then $\sin^2A + \sin^2B = 1$ and $\cos^2A + \cos^2B = 1$.

Standard Values

$\sin 90° = 1$, $\cos 90° = 0$, $\sin 45° = 1/\sqrt{2}$, $\cos 45° = 1/\sqrt{2}$.

Trigonometric Square Identity

The fundamental identity is $\sin^2\theta + \cos^2\theta = 1$ for any angle θ.

Q76. Answer: (a) 3185

Shortcut Trick

Identify the largest two-digit prime number = 97.

Identify the largest three-digit prime number = 997.

Required calculation: (2 × 97) + (3 × 997).

Apply simple multiplication: 194 + 2991 = 3185.

Therefore The correct answer is 3185.

Alternate Method

Given:

Largest two-digit prime number = 97

Largest three-digit prime number = 997

Calculations:

=> Double of the largest two-digit prime number = 2 × 97

=> 2 × 97 = 194

=> Triple of the largest three-digit prime number = 3 × 997

=> 3 × (1000 − 3) = 3000 − 9 = 2991

=> Required sum = 194 + 2991

=> Total sum = 3185

Therefore The correct answer is 3185.

Additional Information

Prime Numbers

A prime number is a natural number greater than 1 that has no positive divisors other than 1 and itself.

Largest Prime Numbers

The largest one-digit prime is 7, the largest two-digit prime is 97, and the largest three-digit prime is 997.

Smallest Prime Number

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

Q77. Answer: (a) -10 cm

The correct answer is Option 1

Key Points

• The radius of curvature (R) of a spherical mirror is given as -20 cm.

• The focal length (f) of a spherical mirror is related to the radius of curvature by the formula: f = R/2.

• Substituting the given radius of curvature: f = -20 cm / 2 = -10 cm.
• Therefore, the focal length of the mirror is -10 cm.

Additional Information

• The negative sign indicates that the mirror is a concave mirror.
• In concave mirrors, the focal length is taken as negative because the focus lies on the same side as the reflecting surface.
• This concept is crucial in understanding the behavior of light and image formation in spherical mirrors.
• The radius of curvature is always twice the focal length for spherical mirrors.

Q78. Answer: (b) ×, ÷

Let's check each option,

1) +, -

→ 12 ÷ 6 × 18 - 16 + 15 = 5
→ 2 × 18 - 16 + 15 = 5
→ 36 - 16 + 15 = 5
→ 51 - 16 = 5
→ 35 ≠ 5
→ LHS ≠ RHS

2) ×, ÷

→ 12 × 6 ÷ 18 + 16 - 15 = 5
→ 12 × 1/3 + 16 - 15 = 5
→ 4 + 16 - 15 = 5
→ 20 - 15 = 5
→ 5 = 5
→ LHS = RHS => Follows the logic.

3) -, ÷

→ 12 - 6 × 18 + 16 ÷ 15 = 5
→ 12 - 6 × 18 + 16/15 = 5
→ 12 - 108 + 16/15 = 5
→ 176/15 - 108 ≠ 5
→ LHS ≠ RHS

4) +, ×

→ 12 ÷ 6 + 18 × 16 - 15 = 5
→ 2 + 18 × 16 - 15 = 5
→ 2 + 288 - 15 = 5
→ 290 - 15 = 5
→ 275 ≠ 5
→ LHS ≠ RHS

Hence, the correct answer is "×, ÷ ".

Q79. Answer: (a) Brahma Kamal

The correct answer is Brahma Kamal

Key Points

• Brahma Kamal is a flower found in the Himalayas known for its antiseptic properties.
• It is traditionally used in the region for the healing of bruises and cuts.
• The flower is also considered sacred and is often used in religious rituals in the Himalayan region.
• Its scientific name is Saussurea obvallata, and it blooms at high altitudes in the Himalayas.

Additional Information

• Brahma Kamal is named after Brahma, the Hindu god of creation, and is considered a symbol of purity and spirituality.
• It blooms during the monsoon season, typically between July and September.
• The flower is also used in Ayurvedic medicine for its healing properties.
• Due to its limited growing regions and the difficulty in harvesting, Brahma Kamal is considered rare and valuable.

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Q80. Answer: (a) Dr. Jagdish Chandra Bose Hindi Granth Lekhan Puraskar Yojna

The correct answer is Dr. Jagdish Chandra Bose Hindi Granth Lekhan Puraskar Yojna

Key Points

• Dr. Jagdish Chandra Bose Hindi Granth Lekhan Puraskar Yojna has been introduced by the Department of Biotechnology, Government of India.

• This scheme is aimed at awarding writers for writing original books in Hindi on subjects related to Biotechnology.

• It encourages the proliferation of scientific literature in Hindi, promoting wider dissemination and understanding of biotechnology topics.

• The scheme is named after Dr. Jagdish Chandra Bose, a pioneering scientist in the field of biophysics and plant physiology.

Additional Information

• The Department of Biotechnology (DBT) under the Ministry of Science and Technology, Government of India, is responsible for promoting and accelerating the pace of development in the field of biotechnology.

• DBT supports research, development, and innovation in biotechnology through various schemes and programs.

• The Dr. Jagdish Chandra Bose Hindi Granth Lekhan Puraskar Yojna is part of DBT's efforts to promote science communication and education in regional languages.

• Biotechnology is a rapidly evolving field with significant implications for healthcare, agriculture, and industry.

Q81. Answer: (c) C < E < D < A < B

The correct answer is Option 3

Concept:

• The pH scale ranges from 0 to 14 and it is inversely related to the concentration of hydrogen ions in a solution.

• Specifically, lower pH values correspond to higher concentrations of H(^+) ions, while higher pH values correspond to lower concentrations of H(^+) ions.

• The relationship is given by the formula: [pH = -log [H^+]]

Explanation:

Given,

A: pH = 4, B: pH = 1, C: pH = 11, D: pH = 7, E: pH = 9

Higher pH = Lower H^+ concentration:

• pH 11 (C) -> lowest concentration of H^+

• In between it would be E, D and A in the increasing order.

• pH 1 (B) -> highest concentration of H^+

• Thus, the order of increasing H^+ concentration is: [C < E < D < A < B]

Therefore, the correct answer is Option 3

Q82. Answer: (c) 8%

Shortcut Trick

Calculate Interest for 1 year: 520 ÷ 5 = Rs. 104.

The Rate of Interest is the annual interest as a percentage of the Principal.

Rate % = (104 ÷ 1300) × 100

Rate % = 104 ÷ 13 = 8%.

Therefore The correct answer is 8%.

Alternate Method

Given:

Principal (P) = Rs. 1,300

Simple Interest (SI) = Rs. 520

Time (T) = 5 years

Formula Used:

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

Calculations:

=> 520 = (1300 × R × 5) ÷ 100

=> 520 = 13 × R × 5

=> 520 = 65 × R

=> R = 520 ÷ 65

=> R = 8

Therefore The correct answer is 8%.

Additional Information

Simple Interest properties

Simple interest remains constant every year because it is always calculated on the original Principal amount.

Compound Interest Comparison

For the first year, Simple Interest and Compound Interest are equal if the interest is compounded annually. Formula: A = P(1 + R/100)^T.

Total Amount Formula

The total amount (A) after time T is given by: Amount = Principal + Simple Interest or A = P(1 + RT/100).

Q83. Answer: (c) Haryana

The correct answer is Haryana

Key Points

• India's first Virtual Smart Grid Knowledge Centre was inaugurated in the state of Haryana in March 2022.

• This centre aims to modernize the electricity grid, enhance efficiency, and integrate renewable energy sources.

• It serves as a platform for demonstrating smart grid technologies and solutions, fostering innovation in the power sector.

• The initiative is part of India's broader efforts to transition to a more resilient and sustainable energy system.

Additional Information

• The establishment of the Virtual Smart Grid Knowledge Centre aligns with India's commitment to achieving its renewable energy targets and reducing carbon emissions.

• Smart grids leverage advanced technologies such as IoT, AI, and machine learning to optimize electricity distribution and consumption.

• Haryana has been at the forefront of adopting innovative solutions in the power sector, contributing to the country's energy security and sustainability goals.

• The centre will also facilitate training and capacity building for stakeholders in the power sector, promoting knowledge sharing and skill development.

Q84. Answer: (c) 10 m

Shortcut Trick

Volume V = $\pi r^2 h$

5500 = (22/7) × r^2 × 70

5500 = 220 × r^2 => r^2 = 25 => r = 5 m

Diameter = 2 × r = 2 × 5 = 10 m

Therefore The correct answer is 10 m.

Alternate Method

Given:

Volume of cylinder (V) = 5500 m^3

Height of cylinder (h) = 70 m

Formula Used:

Volume of cylinder = $\pi r^2 h$

Diameter (d) = 2 × radius (r)

Calculations:

=> 5500 = (22/7) × r^2 × 70

=> 5500 = 22 × r^2 × 10

=> 5500 = 220 × r^2

=> r^2 = 5500 ÷ 220

=> r^2 = 25

=> r = √25 = 5 m

=> Diameter = 2 × 5 = 10 m

Therefore The correct answer is 10 m.

Additional Information

Curved Surface Area (CSA)

The lateral surface area of a cylinder is given by $2\pi rh$.

Total Surface Area (TSA)

The sum of curved area and two circular bases: $2\pi rh + 2\pi r^2 = 2\pi r(h + r)$.

Hollow Cylinder Volume

Volume of material in a hollow cylinder is $\pi(R^2 - r^2)h$, where R is outer and r is inner radius.

Q85. Answer: (c) (10, 48, 6)

The logic followed here is:

Logic: Second number = (First number + Third number) × 3

(11, 57, 8)

→ 57 = (11 + 8) × 3

→ 57 = 19 × 3

(12, 63, 9)

→ 63 = (12 + 9) × 3

→ 63 = 21 × 3

Let's check each option,

1) (12, 45, 8)

→ 45 = (12 + 8) × 3

→ 45 ≠ 20 × 3

2) (15, 75, 7)

→ 75 = (15 + 7) × 3

→ 75 ≠ 22 × 3

3) (10, 48, 6)

→ 48 = (10 + 6) × 3

→ 48 = 16 × 3 => Follows the logic.

4) (12, 54, 11)

→ 54 = (12 + 11) × 3

→ 54 ≠ 23 × 3

Hence, the correct answer is "(10, 48, 6)".

Q86. Answer: (b) k^3 - 3k

Shortcut Trick

For any algebraic expression of the form $x + 1/x = k$, the value of the sum of cubes is given by the formula: $x^3 + 1/x^3 = k^3 - 3k$.

This is a standard identity-based shortcut derived from the algebraic cube of a binomial.

Therefore The correct answer is $k^3 - 3k$.

Alternate Method

Given:

$x + 1/x = k$

Formula Used:

The identity for $(a + b)^3$ is: $a^3 + b^3 + 3ab(a + b)$

Calculations:

=> Cubing both sides of the given equation:

=> $(x + 1/x)^3 = k^3$

=> $x^3 + (1/x)^3 + 3 \times x \times (1/x) \times (x + 1/x) = k^3$

=> $x^3 + 1/x^3 + 3 \times 1 \times (x + 1/x) = k^3$

=> Substitute $x + 1/x = k$ into the expression:

=> $x^3 + 1/x^3 + 3k = k^3$

=> $x^3 + 1/x^3 = k^3 - 3k$

Therefore The correct answer is $k^3 - 3k$.

Additional Information

Square Identity Relation

If $x + 1/x = k$, then $x^2 + 1/x^2 = k^2 - 2$. This is derived by squaring both sides of the base equation.

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Negative Sign Cube Relation

If $x - 1/x = k$, then $x^3 - 1/x^3 = k^3 + 3k$. Note the change in the arithmetic sign from minus to plus.

Higher Power Relation (Power 4)

If $x + 1/x = k$, then $x^4 + 1/x^4 = (k^2 - 2)^2 - 2$, obtained by squaring the result of the square identity.

BODMAS Rule

Always ensure order of operations is followed when calculating numerical values for k in competitive exams.

Q87. Answer: (a) Tamil Nadu

The correct answer is Tamil Nadu

Key Points

• St. Thomas Cathedral Basilica Church is located in Tamil Nadu.

• It is situated in the city of Chennai.

• This church is a significant historical and religious site, as it is believed to be the final resting place of St. Thomas the Apostle.

• The church is one of the three churches in the world that are built over the tomb of an apostle of Jesus Christ.

• It is a popular tourist attraction and a place of pilgrimage for Christians.

Additional Information

• The St. Thomas Cathedral Basilica Church was originally built by the Portuguese in the 16th century.

• It was later rebuilt by the British in 1896, giving it the present Gothic style architecture.

• The church is not only a religious site but also a symbol of the rich cultural heritage and colonial history of Chennai.

• It has been declared a National Shrine by the Catholic Bishops' Conference of India.

• Visitors to the church can also explore the St. Thomas Museum located within the premises, which houses artifacts related to St. Thomas and the history of the church.

Q88. Answer: (b) 490

Given:

Expression to simplify: 234 × [8 - (6 + 2) × 3] + 4234

Concept Used:

Calculation:

234 × [8 - (6 + 2) × 3] + 4234

=> 234 × (8 - 24) + 4234

=> 234 × (-16) + 4234

=> -3744 + 4234 = 490

The correct answer is 490.

Q89. Answer: (a) neutralisation reaction

The correct answer is neutralisation reaction

Key Points

• The reaction between magnesium hydroxide (Mg(OH)2) and hydrochloric acid (HCl) is a neutralisation reaction.

• In a neutralisation reaction, an acid reacts with a base to form a salt and water.

• Here, Mg(OH)2, a base, reacts with HCl, an acid, to form MgCl2 (a salt) and H2O (water).

• This type of reaction is important in various applications, including antacid formulations and industrial processes.

Additional Information

• A decomposition reaction involves breaking down a single compound into two or more simpler substances, which is not the case here.

• A combination reaction involves two or more substances combining to form a single product, which is also not applicable here.

• A precipitation reaction involves the formation of an insoluble solid (precipitate) from a solution, which does not occur in this reaction.

• Neutralisation reactions are a subset of double displacement reactions where the reactants exchange ions to form water and a salt.

Q90. Answer: (c) Study of landforms

The correct answer is Study of landforms

Key Points

• Geomorphology is the branch of physical geography that is devoted to the study of landforms.

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• It involves understanding the processes that shape the Earth's surface and the structures that result from these processes.

• Geomorphology examines various landforms such as mountains, valleys, plateaus, and plains, and aims to explain their formation, evolution, and distribution.

• It integrates knowledge from geology, hydrology, climatology, and other Earth sciences to provide a comprehensive understanding of the physical landscape.

Additional Information

• Geomorphologists use a variety of tools and techniques, including field surveys, remote sensing, and GIS (Geographic Information Systems) to study landforms.

• The study of geomorphology is crucial for understanding natural hazards such as earthquakes, landslides, and floods, and for planning land use and managing natural resources.

• Knowledge of geomorphology is applied in various fields including environmental management, urban planning, and civil engineering.

• The term "geomorphology" is derived from the Greek words "geo" meaning Earth, "morph" meaning form, and "logy" meaning study.

Q91. Answer: (b) England

The correct answer is England

Key Points

• India won the U-19 World Cup title for the fifth time in February 2022.

• India defeated England by four wickets in the final match.

• This victory extended India's record as the team with the most U-19 World Cup titles.

• The final was held at the Sir Vivian Richards Stadium in North Sound, Antigua.

• India chased down England's target of 190 runs, showcasing strong performances from their young cricketers.

Additional Information

• The U-19 Cricket World Cup is an international cricket tournament organized by the International Cricket Council (ICC) for national teams with players under the age of 19.

• India's U-19 team has a history of strong performances in the tournament, with previous wins in 2000, 2008, 2012, and 2018.

• The tournament serves as a platform for young cricketers to showcase their talents on an international stage.

• Several players from India's U-19 teams have gone on to achieve significant success in international cricket.

Q92. Answer: (b) 28

The given number is → (Left 521987624 (Right)

When arranged in descending order → 987654221

Number which is third from the left → 7

Number which is fourth from the right → 4

Product of the digits that are third from the left and fourth from the right is: 7 × 4 = 28

Hence, the correct answer is "28".

Q93. Answer: (d) its formation requires a large amount of energy

The correct answer is its formation requires a large amount of energy

Key Points

• Carbon is unable to form C^(4+) ion because its formation requires a large amount of energy.

• Carbon has a strong tendency to share electrons rather than lose or gain them due to its small size and high ionization energy.

• Forming a C^(4+) ion would require removing four electrons, which demands a substantial amount of energy due to the strong attraction between the nucleus and the electrons.

• This high energy requirement makes the formation of C^(4+) ion highly unfavorable and impractical under normal conditions.

Additional Information

• Carbon is a versatile element known for its ability to form various compounds due to its tetravalency.

• It can form stable covalent bonds with other carbon atoms and elements, leading to a vast number of organic compounds.

• The ability of carbon to form chains and rings through catenation is a fundamental aspect of organic chemistry.

• Carbon compounds are essential in many fields, including biology, chemistry, and materials science.

Q94. Answer: (b) 5320

Given:

The total number of students enrolled in the university = 15200

Percentage of students in the Medical stream = 15%

Percentage of students in Engineering stream = 11%

Percentage of students in Law stream = 9%

Formula Used:

Number of students in a stream = (Percentage of students in that stream / 100) × Total number of students

Calculation:

Number of students in Medical stream = (15 / 100) × 15200

=> Number of students in Medical stream = 0.15 × 15200

=> Number of students in Medical stream = 2280

Number of students in Engineering stream = (11 / 100) × 15200

=> Number of students in Engineering stream = 0.11 × 15200

=> Number of students in Engineering stream = 1672

Number of students in Law stream = (9 / 100) × 15200

=> Number of students in Law stream = 0.09 × 15200

=> Number of students in Law stream = 1368

Total number of students in Medical, Engineering, and Law streams taken together = 2280 + 1672 + 1368

=> Total number of students in Medical, Engineering, and Law streams taken together = 5320

The correct answer is option 2.

Q95. Answer: (d) the incident ray and the emergent ray

The correct answer is option 4

Key Points

• The angle of deviation for a ray of light undergoing refraction through a triangular glass prism is the angle between the incident ray and the emergent ray.

• This angle represents how much the light path has been altered due to the prism.

• The deviation occurs because of the change in speed of light as it passes through different media, causing the light to bend.

• The incident ray is the incoming ray that strikes the surface of the prism, and the emergent ray is the outgoing ray that exits the prism.

Additional Information

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

• The prism causes the light to deviate due to its triangular shape and the different angles of incidence and emergence.

• The formula for the angle of deviation (δ) in a prism is given by: δ = (i1 + i2) - A, where i1 is the angle of incidence, i2 is the angle of emergence, and A is the angle of the prism.

• The angle of deviation depends on the wavelength of the light, with shorter wavelengths (blue/violet) bending more than longer wavelengths (red).

Q96. Answer: (a) 11:24 hrs

Shortcut Trick

Time taken by A = 4 hours and B = 6 hours.

LCM of 4 and 6 = 12 units (Total Distance).

Speed of A = 12 ÷ 4 = 3 units/hr; Speed of B = 12 ÷ 6 = 2 units/hr.

Meeting time = Total Distance ÷ Relative Speed = 12 ÷ (3 + 2) = 2.4 hours.

2.4 hours = 2 hours + (0.4 × 60) mins = 2 hours 24 mins after 9:00 a.m.

Therefore The correct answer is 11:24 hr.

Alternate Method

Given:

Departure of A and B = 9:00 a.m.

Arrival of A = 1:00 p.m. => Time (t_A) = 4 hours.

Arrival of B = 3:00 p.m. => Time (t_B) = 6 hours.

Formula Used:

Relative Speed = Speed_A + Speed_B (when moving in opposite directions)

Meeting Time = Distance ÷ Relative Speed

Calculations:

=> Let distance XY = D km.

=> Speed of A = D/4 km/hr and Speed of B = D/6 km/hr.

=> Relative Speed = D/4 + D/6 = (3D + 2D) / 12 = 5D/12 km/hr.

=> Time to meet = D ÷ (5D/12) = 12/5 hours.

=> 12/5 hours = 2 hours + 2/5 hours = 2 hours (2/5 × 60) mins = 2 hours 24 mins.

=> Meeting Time = 9:00 a.m. + 2 hours 24 mins = 11:24 a.m.

Therefore The correct answer is 11:24 hr.

Additional Information

Relative Speed Concept

When two objects move towards each other, their relative speed is the sum of their individual speeds (S1 + S2). If they move in the same direction, it is the difference (S1 − S2).

Time and Distance Relation

For a constant distance, speed is inversely proportional to time (S1/S2 = T2/T1).

Meeting Time formula

Meeting Time = (Initial Distance between them) ÷ (Relative Speed). Ensure both start times are the same before applying this.

Q97. Answer: (a) water

The correct answer is water

Key Points

• Water is essential for the structure and function of plant cells.

• It helps maintain cell turgor pressure, which is crucial for supporting the plant structure and facilitating growth and movement.

• When plant cells absorb water, they become turgid, providing rigidity to the plant tissues.

• In conditions where water is scarce, plant cells lose turgor pressure and become flaccid, which can lead to wilting and reduced movement.

• Water movement through the plant is also vital for transporting nutrients and minerals from the soil to various parts of the plant.

Addit ional Information

• Photosynthesis, a critical process for plant survival, requires water as a raw material.

• Water is also involved in various biochemical processes within the plant cells.

• Plants have specialized structures like stomata to regulate water loss and maintain hydration.

• Efficient water management is crucial for agriculture and horticulture practices to ensure healthy plant growth and productivity.

• Understanding the role of water in plant physiology helps in developing strategies for improving crop resilience to drought and other water-related stresses.

Q98. Answer: (c) -65

Given:

The value of the expression: {4 - 3 × [7 - 8 × (2 × 4 - 10)]}

Concept used:

Calculation:

{4 - 3 × [7 - 8 × (2 × 4 - 10)]}

=> {4 - 3 × [7 - 8 × (8 - 10)]}

=> {4 - 3 × [7 - 8 × (-2)]}

=> {4 - 3 × [7 +16]}

=> 4 - 69

=> - 65

The correct answer is -65.

Q99. Answer: (d) 7 : 6

Given:

Number of male employees in Production = 160

Number of female employees in Production = 155

Number of male employees in Operations = 128

Number of female employees in Operations = 142

Formula Used:

Ratio = Total number of employees in Production / Total number of employees in Operations

Calculation:

Total number of employees in Production = 160 + 155

Total number of employees in Production = 315

Total number of employees in Operations = 128 + 142

Total number of employees in Operations = 270

Ratio = 315 / 270

=> Ratio = 7 / 6

Therefore The correct answer is 7:6.

Q100. Answer: (b) Flexibility in the taxation system.

The correct answer is Option 2

Key Points

• Special Economic Zones (SEZs) have been set up to attract foreign companies to invest in India. These zones offer various incentives such as tax exemptions and simplified procedures.

• There is flexibility in the labour laws to ensure that foreign companies find it easier to hire and manage employees in India.

• Special Economic Zones (SEZs) allow production units to operate with tax benefits for an initial period of five years, making it financially attractive for foreign investors.

• However, flexibility in the taxation system has not been a specific step taken by the government to attract foreign companies to invest in India.

Additional Information

• The Indian government has implemented several policies to create a more conducive environment for foreign investment, including the establishment of SEZs, liberalizing FDI policies, and improving infrastructure.

• The Make in India initiative is another significant step aimed at encouraging foreign companies to set up manufacturing units in India.

• These efforts are part of a broader strategy to boost economic growth, create jobs, and enhance the country's global competitiveness.

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