RRB Group D Previous Year Paper (Held on: 22 Sept 2022 Shift 1)

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

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CBT

Q1. Find the value of 345.08 + 56.02 + 44.44 × 2.2 - 12.22.

(a) 486.648
(b) 486.684
(c) 498.868
(d) 468.648

Q2. Read the given statement(s) and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statement(s).

Statements:

All pens are pencils.

No pencil is a cutter.

All cutters are rubbers.

Conclusions:

1. All rubbers are pencils.

2. No pen is a cutter.

(a) Only conclusion 2 follows.
(b) Only conclusion 1 follows.
(c) Both conclusions 1 and 2 follow.
(d) Neither 1 nor 2 is follows.

Q3. The Bay of Bengal's islands of Andaman in the north and the Nicobar in the south are separated by a waterbody which is called the _____ channel.

(a) ten degree
(b) twenty degree
(c) thirty degree
(d) forty degree

Q4. Where is the headquarters of State Bank of India (SBI)?

(a) New Delhi
(b) Mumbai
(c) Chennai
(d) Kolkata

Q5. Five laptop boxes marked with Z, X, W, V and U are kept one above the other but not necessarily in the same order. W is kept immediately above V. U is kept third from the top. W is neither the topmost nor the bottom most box. Z is kept immediately below X. Which box is kept immediately below Z?

(a) X
(b) V

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(c) W
(d) U

Q6. Which of the following statements regarding Dobereiner's triads is NOT correct?

(a) If three elements are arranged in the decreasing sequence of atomic masses, then atomic mass of the third element is approximately the average of the atomic masses of the other two elements.
(b) Cl, Br and I constitute Dobereiner's triads.
(c) Li, Na and K constitute Dobereiner's triads.
(d) If three elements are arranged in the increasing sequence of atomic masses, then atomic mass of the middle element is approximately the average of the atomic masses of the other two elements.

Q7. The Ayurveda dataset on The Clinical Trials Registry-India (CTRI) Portal was launched by the _____ in July 2021.

(a) Ministry of Science and Technology
(b) Ministry of AYUSH
(c) Ministry of Electronics and IT
(d) Ministry of Health and Family Welfare

Q8. Consider several electric bulbs designed to be used on a 240 V electric supply line. The bulbs are rated as 10 W. How many bulbs can be connected in parallel with each other across the two wires of the 240 V line if the maximum allowable current is 8 A?

(a) 212
(b) 156
(c) 174
(d) 192

Q9. What reactants are formed when calcium carbonate is heated?

(a) Burnt lime
(b) Limestone
(c) Marble
(d) How many

Q10. How many such pairs of letters are there in the word ABSENT (in both forward and backward directions) which have as many letters between them as there are in the English alphabetical order?

(a) One
(b) None
(c) Two
(d) Three

Q11. Pinto went 12 km to the south from his house, then he turned east and covered 8 km, then he turned north and covered 6 km. Finally tuning to the west, he covered 13 km. In which direction is he from his house? (All turns are 90 degree turns only)

(a) North
(b) South-west
(c) South
(d) South-east

Q12. If each letter of the following words is written in their opposite order, the new words/letters that will be formed If they are arranged in English dictionary order, which word/syllable will come in the middle position?

LOST, TALK, WALK, KALM, SHAW

(a) KALM
(b) SHAW
(c) WALK
(d) LOST

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Q13. Five people, Zunaid, Riya, Hema. Indu and Jagan, are sitting around a circular table facing the centre (but not necessarily in the same order). Zunaid is sitting second to the left of Indu. Hema is sitting second to the right of Riya. Jagan is not an immediate neighbour of Zunaid.

Who is sitting third to the right of Riya?

(a) Hema
(b) Jagan
(c) Indu
(d) Zunaid

Q14. Suppose a point source is incident on a system and it produces a beam parallel to the principal axis of the system. The system is

(a) Either a concave mirror or a convex lens
(b) Either a convex mirror or a convex lens
(c) Two plane mirrors that are perpendicular to each other
(d) Either a concave mirror or a concave lens

Q15. According to a provision in Article 124 of the Constitution of India, a Supreme Court judge can hold office till the age of _____ years.

(a) 62
(b) 60
(c) 65
(d) 67

Q16. Simplify

$(731)^2 - (269)^2 = ?$

(a) 462000
(b) 452000
(c) 464000
(d) 450000

Q17. Suppose Raghu places an object at different distances (u) in front of a concave mirror of focal length (f) and he measures the corresponding reflection distance (v). And from its value, Raghu plotted the magnification m with respect to it. Which of the following options is true?

(a) It is a straight line whose slope is -f, and -1 is the x-intercept and -f is the y-intercept.
(b) It is a straight line with slope +1/f, and +f is the x-intercept and -1 is the y-intercept.
(c) It is a straight line with slope +f, and -1 at the x-intercept and 1/f at the y-intercept.
(d) It is a straight line with slope -1/f, and -1 is the x-intercept and +f is the y-intercept.

Q18. From a point O, Mohita started walking and covered a distance of 30 m in the west direction. She then turned to her left and covered a distance of 15 m. She then took a left turn and travelled a distance of 10 m. Finally, she turned to the left and covered a distance of 15 m. How far and in which direction is she now from the starting point O? (All turns are 90 degree turns only)

(a) 20 m, West
(b) 10 m, South
(c) 20 m, North
(d) 10 m, East

Q19. Which of the following numbers will replace the question mark (?) in the given series?

20, 20, 22, 66, 70, ?

(a) 340
(b) 75
(c) 74
(d) 350

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Q20. In which year were Bodo, Dogri, Maithili and Santhali were added in the list of languages of the Eighth Schedule of the Constitution of India?

(a) 2010
(b) 2002
(c) 2004
(d) 2006

Q21. Find the mode of a moderately skewed data using empirical relation, given its mean is 222.4 and median is 216.6.

(a) 218
(b) 222
(c) 216
(d) 205

Q22. If the length of each side of a cube is increased to three times its initial length, then its volume will become _____ times its initial volume.

(a) 9
(b) 6
(c) 27
(d) 3

Q23. What is the net discount, if two successive discounts of 10% and 12% are given?

(a) 20.8%
(b) 23.2%
(c) 22.0%
(d) 21.4%

Q24. The disease AIDS is caused by:

(a) fungus
(b) virus
(c) mycobacterium
(d) bacterium

Q25. If '÷' and '-' are interchanged, what will be the value of the given expression?

18 - 6 + 14 × 10 ÷ 5

(a) 96
(b) 138
(c) 120
(d) 148

Q26. In the given letter-cluster pairs, the first letter-cluster is related to the second letter-cluster following a certain logic. Study the given pairs carefully, and from the given options, select the pair that follows the same logic.

LINE : MHOD

GOAT : HNBS

(a) PAIR : QZJQ
(b) JSQB : IPPA
(c) CLUE : DKVF
(d) TRIP : USJO

Q27. Find the third proportional to 60 and 90.

(a) 120
(b) 90
(c) 135
(d) 75

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Q28. The value of (tan A)/(1-cot A) + (cot A)/(1 - tan A) is:

(a) sec A cosec A + 1
(b) cosec A cos A + 1
(c) sec A sin A + 1
(d) sec A cosec A - 1

Q29. Which of the following numbers will replace the question mark (?) in the given series?

78, 32, 68, 64, 58, 128, 48, 256, ?

(a) 34
(b) 24
(c) 28
(d) 38

Q30. The number of nonoverlapping triangles that can be formed in an 11 - sided polygon by joining the vertices are:

(a) 10
(b) 11
(c) 9
(d) 8

Q31. The magnetic field lines produced by a bar magnet _____.

(a) originate from its north pole and end at its east pole
(b) originate from its south pole and end at its east pole
(c) originate from its south pole and end at its north pole
(d) originate from its north pole and end at its south pole

Q32. Select the option that represents the letters that, when placed from left to right in the same sequence in the blanks below, will complete the letter series.

SX_ABS_YBBSXY_BSX_DB

(a) XCCY
(b) CXYX
(c) YXCY
(d) XCYC

Q33. Which element has the hardest natural allotrope?

(a) Pb
(b) S
(c) Sn
(d) C

Q34. The second number is related to the first number and the fourth number to the third number in the same way as to the fifth number

Select the corresponding option.

(Note: Performing arithmetic operations on whole numbers without breaking them down into their constituent digits should Namely 13

Operations like addition/subtraction/multiplication etc. can be done with 13. 13 k. and 3

Break in and then. and it is not allowed to perform arithmetic operations on o)

10 : 21 :: 11 : 23 :: 12 : ?

(a) 24
(b) 23
(c) 25
(d) 26

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Q35. Which of the following instruments use the principle of refraction?

(a) Spectacles
(b) Mobile
(c) Clock
(d) Radio

Q36. The theme of International Women's Day 2022 issued by the United Nations was _____.

(a) Think Equal, Build Smart, Innovate for Change
(b) An Equal World is an Enabled World
(c) Gender Equality Today for a Sustainable Tomorrow
(d) Women in Leadership: Achieving an Equal Future in a COVID-19 World

Q37. You are given a statement followed by two assumptions numbered I and II. You have to consider the statement to be true even if it seems to be at variance from commonly known facts. You have to decide which of the given assumptions can definitely be drawn from the given statement.

Statement:

Due to ongoing road work, all traffic on Road X is being diverted to the Airport Road.

Assumptions:

I. There is heavy traffic jam on the Airport Road.

II. Flights are being rescheduled because people are not able to reach the airport on time.

(a) Both I and II are embedded.
(b) Only assumption II is Embedded
(c) Only assumption I is embedded
(d) Neither I nor II is embedded

Q38. Where did Gautam Buddha deliver his first sermon?

(a) Sarnath
(b) Kushinagar
(c) Bodh Gaya
(d) Lumbini

Q39. Which amendment added a chapter IV-A to Indian Constitution which consisted of only one Article 51-A that dealt with Fundamental Duties?

(a) 42^(nd)
(b) 53^(rd)
(c) 44^(th)
(d) 58^(th)

Q40. Fleming's right hand rule gives us

(a) Direction of induced current
(b) Direction of magnetic field
(c) Value of induced EMF
(d) Value and direction of induced EMF

Q41. Which of the following options is the closest approximate value which will come in place of question mark(?) in the following equation?

104.96 + 120.96 + 103.16 - 12.89 × 2.04 + 124.93 ÷ 5.1 = ?

(a) 330
(b) 340
(c) 328
(d) 334

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Q42. As of August 2022, under the Naya Savera Scheme, only candidates belonging to the notified Minority Communities, having the total family income from all sources NOT exceeding _____ per annum, will be eligible under the Scheme.

(a) Rs. 6 lakh
(b) Rs. 8 lakh
(c) Rs. 4 lakh
(d) Rs. 2 lakh

Q43. What does ‘conservation’ mean in terms of a natural resource like water?

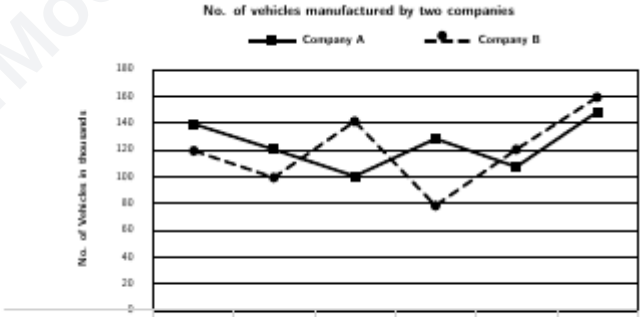
(a) Stop its use
(b) Manage it wisely
(c) Leave it in a natural condition
(d) Protect against pollution

Q44. A cube each of whose side is 5 cm will have a total surface area of _____ cm^2.

(a) 80
(b) 120
(c) 60
(d) 150

Q45. Study the given chart and answer the question that follows.

The numbers 1 to 6 represent the years from 2001 to 2006.



What is the average number of vehicles (approx.) manufactured by company B over the given period?

(a) 1,19,333
(b) 1,23,666
(c) 1,22,778
(d) 1,11,223

Q46. Find the HCF of 1248 and 2456.

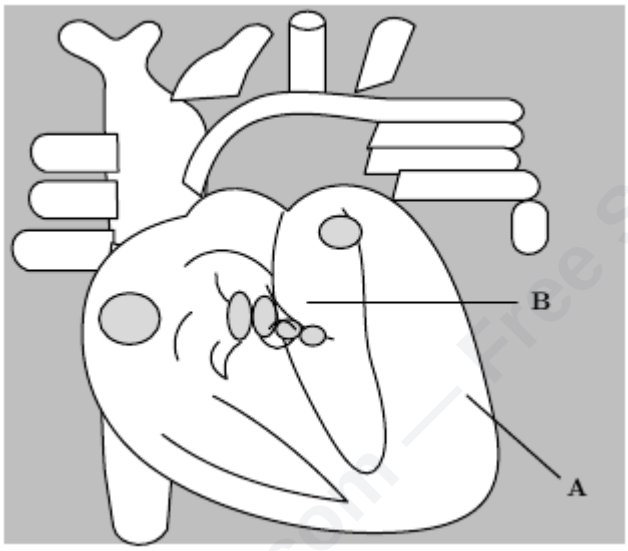
(a) 12
(b) 8
(c) 14
(d) 16

Q47. Two questions based on the transverse section of human heart are given below. Find the option that gives the correct answers to both the questions.

Q. Why does the part labelled 'A’ have thick walls?

Q. What is the function of the part labelled ‘B' ?

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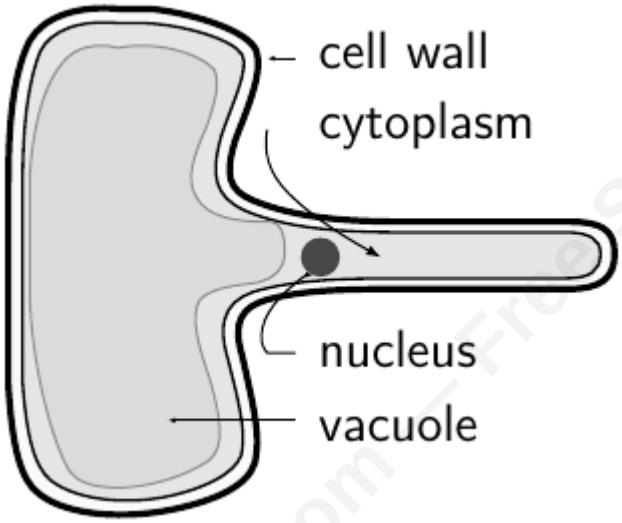
(a) A - Because it pumps blood to the left auricle
B - Does not let the blood flow forward
(b) A - Because it pumps blood to different parts of the body
B - Prevents back flow of blood
(c) A - Because it pumps blood to the pulmonary artery
B - Pumps blood to aorta
(d) A - Because it pumps blood to the right auricle
B - Prevents back flow of blood

Q48. Which of the following continues to grow and develop organs to become a foetus?
(a) Embryo
(b) Zygote
(c) Placenta
(d) Egg

Q49. If
'+' means '×',
'-' means '÷',
'×' means '-' and
'÷' means '+',
then which number will replace the question mark (?) in the following expression?
11 + 35 - 5 × 8 ÷ 3 = ?
(a) 32.6
(b) -32.6
(c) -72
(d) 72

Q50. What do you call profits earned by a business firm over and above the opportunity cost of the factor inputs?
(a) Regulated Profit
(b) Abnormal Profit
(c) Normal Profit
(d) Optimum Profit

Q51. Where in a plant can we find such a cell?



(a) Seed (germination)
(b) Xylem
(c) Root
(d) Shoot tip

Q52. Shenoy borrowed Rs. 4,50,000 at 5% per annum compounded annually. What is the amount he has to pay at the end of 2 years?
(a) Rs. 4,96,125
(b) Rs. 4,75,000
(c) Rs. 4,65,000
(d) Rs. 4,82,725

Q53. Each vowel in the word SANITY is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order. If each letter, thus formed, is arranged in alphabetical order, which letter will be fourth from the left?
(a) S
(b) X
(c) R
(d) J

Q54. Which of the options below is equivalent to $8x^3 + 27y^3 + 36x^2y + 54xy^2$.
(a) $(3x + 2y)^3$
(b) $(2x + 3y)^3$
(c) $(4x + 3y)^3$
(d) $(2x + 5y)^3$

Q55. Ren and Martin started a company on 1 March 2019. The ratio of their investments was 5 : 4. Martin left the company after 15 months. In what ratio must the profit be divided at the end of 2 years?
(a) 29 : 19
(b) 2 : 1
(c) 24 : 15
(d) 1 : 3

Q56. EI-Nino is a complex weather system that appears once every _____ years, bringing drought, floods, and other weather extremes to different parts of the world including India.
(a) two to four
(b) three to seven
(c) four to six
(d) three to eight

Q57. Which of the following is the correct name of a carbon compound with three-carbon chains and a ketone group?

(a) Propanol
(b) Propanone
(c) Propanal
(d) Propene

Q58. Five students A, B, C, D and E are sitting around a circular table facing the centre (but not necessarily in the same order). A is an immediate neighbour of both B and E. C is sitting to the immediate right of D. B is sitting to the immediate right of C. Who is an immediate neighbour of C and E?

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

Q59. Which of the following plants is a parasite?

(a) Mango
(b) Pitcher plant
(c) Cactus
(d) Cuscuta

Q60. If the sum of the roots of a quadratic equation is -7 and product of the roots of the same equation is -12, then the quadratic equation is given as _____.

(a) $x^2 + 7x + 12 = 0$
(b) $x^2 - 7 = 0$
(c) $x^2 - 12 = 0$
(d) $x^2 + 7x - 12 = 0$

Q61. Two successive discounts of 15% and x% on the sale of an item is equivalent to a single discount of 23.5%. What is the value of x%?

(a) 12%
(b) 10%
(c) 9%
(d) 11%

Q62. [{(1690 - 934) × 5over6 + 815} ÷ 17] equals:

(a) 27
(b) 85
(c) 17
(d) 58

Q63. Five boxes A, B, C, D and E are kept one over the other but not necessarily in the same order. D is kept third from the bottom. Only one box is kept between D and C. There are only three boxes between B and C. E is placed immediately above C. How many boxes are placed between A and B?

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

Q64. A certain percentage of deposits which every bank must keep as ‘reserves’ is called _____.

(a) Cash Reserve Ratio (CRR)
(b) Statutory Liquidity Ratio (SLR)
(c) Fixed Deposits with RBI
(d) Compulsory Deposit in Central Bank

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Q65. A number added to its one-third is equal to 12. The number is _____.

(a) 6
(b) 9
(c) 4
(d) 3

Q66. Who among the following is also known as 'Punjab Keshari'?

(a) Sardar Vallabhbhai Patel
(b) Lala Lajpat Roy
(c) Bhagat Singh
(d) Bal Gangadhar Tilak

Q67. If in each of the following words, each letter is changed to the next letter in the English alphabetical order, how many words thus formed will have NO vowel?

1) BOOK
2) PAPER
3) BOAT
4) PINK

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

Q68. Each of the six students of class XII, Q, R, U, V, Y and Z, has an online medical entrance exam on a different day of a week, starting from Tuesday and ending on Sunday of the same week, but not necessarily in the same order. None of them have the exam before U. Y has the exam immediately after U. V has the exam on Saturday and Z has the exam immediately before V. Q does not have the exam on Sunday.

Who among the following has the exam on Thursday?

(a) Z
(b) R
(c) Q
(d) Y

Q69. In a code language, the numbers/symbols are coded using letters as per the table given below and as per the given conditions.

Number/Symbol	**6**	**^**	**8**	**@**	**4**	**#**	**9**	**$**	**1**	**&**	**3**	**•**
Code	T	D	C	R	G	B	Y	H	N	J	P	L

Conditions:

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

2. If both the second and third elements are odd numbers, the third element is to be coded as the code for the second element.

3. If the first element is a number and the last a symbol, the first and last elements are ta be coded as ©.

What will be the code for 913@#4 ?

(a) YPNRBG
(b) YNPRBG
(c) YNNRBG
(d) YPPRBG

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Q70. Match the columns.

Group-I	Group-B
I. Heart	A. Pumping organ
II. Arteries	B. Carries deoxygenated blood
III. Veins	C. Carries oxygenated blood

(a) I - C; II - B; III - A
(b) I - A; II - B; III - C
(c) I - C; II - A; III - B
(d) I - A; II - C; III - B

Q71. The product of two numbers is 2160 and their HCF is 12. One of the possible pairs of numbers is:
(a) (12, 184)
(b) (12, 185)
(c) (36, 60)
(d) (35, 60)

Q72. At what rate per annum would a sum of Rs. 8,000 amount to Rs. 9,261 in 11 over2 years, interest being compounded half-yearly?
(a) 10%
(b) 20%
(c) 5%
(d) 15%

Q73. The chemical reaction in which two reactants exchange their ions to form two new compounds is known as:
(a) double displacement reaction
(b) combination reaction
(c) displacement reaction
(d) reduction reaction

Q74. Seema is younger than Reema by 4 years. After 4 years the sum of their ages will be 44 years. What is Reema's present age?
(a) 20 years
(b) 12 years
(c) 16 years
(d) 32 years

Q75. Out of the following choose the conventional source of energy:
(a) Nuclear energy
(b) Hydroelectric energy
(c) Bio Mass energy
(d) Tidal energy

Q76. Which bank is called 'lender of last resort' in Indian monetary system?
(a) Federal Bank
(b) State Bank of India
(c) Central Bank of India
(d) Reserve Bank of India

Q77. Select the set whose numbers are related in the same way as the numbers in the following set.

Ans

(Note: Operations should be performed on whole numbers, rather than separating numbers into their constituent digits. For example, arithmetic operations such as addition/subtraction/multiplication can be applied to 13 13. 13

K separates into 1 and 3 and then arithmetic operations on 1 and 3 are not allowed

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(63, 72)

(28, 32)

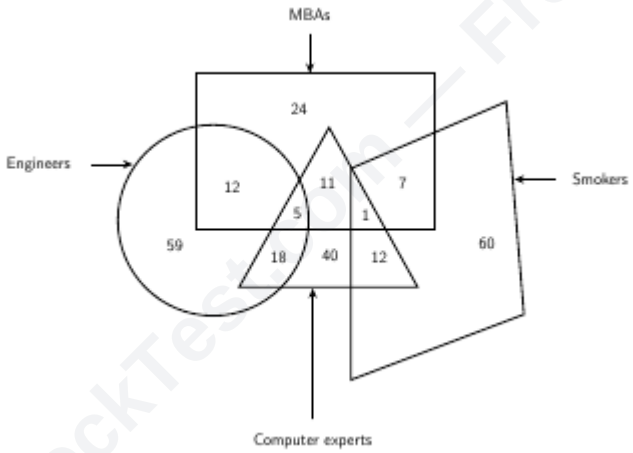
(a) (42, 48)

(b) (40, 48)

(c) (56, 63)

(d) (64, 56)

Q78. Study the given diagram carefully and answer the questions. The numbers in different sections indicate the number of employees.



How many employees with MBA degrees are computer experts but are NOT engineers and also don't smoke?

(a) 5

(b) 12

(c) 3

(d) 11

Q79. An equation, whose roots are the reciprocals of the roots of the equation $5x^2 - 3x - 4 = 0$, is:

(a) 4x2 - 3x + 5 = 0

(b) 4x2 + 3x - 5 = 0

(c) 4x2 - 3x - 5 = 0

(d) 4x2 + 3x + 5 = 0

Q80. The cultural festival 'Thrissur Pooram' is celebrated in which state?

(a) West Bengal

(b) Kerala

(c) Telangana

(d) Karnataka

Q81. Babli travelled for 14 hours. If she covered one-fourth of the journey at a speed of 25 km/h and the remaining at 30 km/h, what is the total distance travelled by her?

(a) 400 km

(b) 225 km

(c) 340 km

(d) 140 km

Q82. The following table shows the population (in lakhs) of four cities (A, B, C and D) over the past four years. Study the table and answer the question.

City's Name	2018-19 (In lakhs)	2020-21 (In lakhs)
A	78	92
B	61	84
C	71	92

D	72	95

Which city has registered the highest percentage of population growth from 2018-2019 to 2020-2021?

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

Q83. Under Article 243 E of the Constitution of India, every Panchayat, unless sooner dissolved under any law for the time being in force, shall continue for _____ years from the date appointed for its first meeting and no longer.

(a) four
(b) five
(c) six
(d) three

Q84. G is the centroid of Δ ABC. AD is a median of ΔABC intersecting BC at D. What is the ratio of the lengths of AG and GD ?

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

Q85. Which of the following is the best action to increase the thickness of the ozone layer?

(a) Reduce use of fluorine-based refrigerants
(b) Increase the percentage of oxygen in our atmosphere
(c) Reduce emission of carbon dioxide
(d) Release ozone-filled balloons that will burst at high altitude

Q86. Which of the following pairs of elements belonging to the same group exhibit similar chemical properties?

(a) N and P
(b) Li and Kr
(c) C and Cl
(d) Mg and Mn

Q87. Who received the Arjuna Award 2021 for outstanding performance in the discipline of boxing?

(a) Bhavina Patel
(b) Simranjit Kaur
(c) Monika
(d) Arpinder Singh

Q88. Suppose a lamp is connected to a battery of 10 V and current flowing through the lamp is 2 A. The heat energy produced by the lamp in 10 s is:

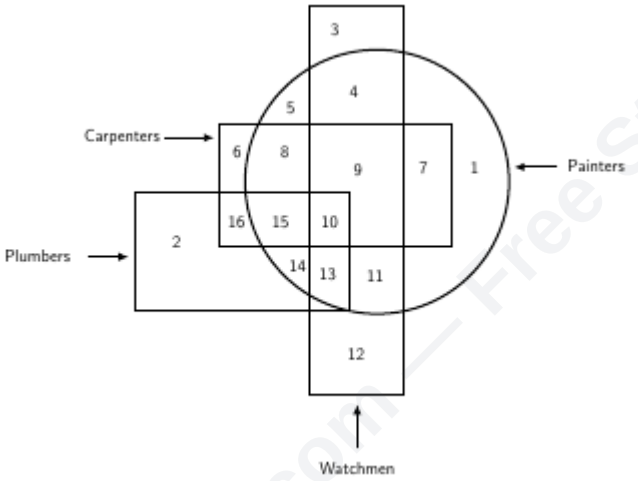
(a) 175 J
(b) 200 J
(c) 100 J
(d) 50 J

Q89. Anil and Sunil started a business investing equal amounts, Anil left after 9 months. They earned an annual profit of Rs. 28,000. What is Sunil's share of annual profit?

(a) Rs. 15,000
(b) Rs. 16,000
(c) Rs. 12,000
(d) Rs. 13,000

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Q90. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons. What does region '13' represent?



(a) The numbers of painters who are only plumbers and neither watchmen nor carpenters.
(b) The number of painters who are plumbers and also watchmen but not carpenters.
(c) The number of carpenters who are only watchmen.
(d) The number of painters who are only watchmen.

Q91. A student plots three graphs for I against V for three Ohmic conductors A, B and C. He found that the slope of these three graphs are 0.5, 0.1 and 0.2, respectively. If the conductors have the same length and their cross-section areas are in the ratio 1 : 2 : 3, then their resistivity ratios i.e. ρ_A : ρ_B : ρ_C will be:

(a) 2 : 20 : 15
(b) 4 : 20 : 15
(c) 3 : 20 : 15
(d) 1 : 20 : 15

Q92. Which Indian badminton player was the runner-up in the Yonex All England Open Badminton Championships 2022?

(a) Kidambi Srikanth
(b) Purupalli Kashyap
(c) Lakshya Sen
(d) Chirag Sen

Q93. In February 2022, a joint team of scientists from which of the following organisations for the first time in the country successfully demonstrated Quantum Key Distribution link between Prayagraj and Vindhyachal in Uttar Pradesh, a distance of more than 100 kilometres?

(a) Defence Research and Development Organisation (DRDO) and Indian Institute of Technology (IIT), Delhi
(b) Defence Research and Development Organisation (DRDO) and Indian Institute of Science, Bengaluru
(c) Indian Space Research Organisation (ISRO) and Indian Institute of Technology (IIT), Delhi
(d) Defence Electronics Research Laboratory (DERL) and Indian Institute of Technology (IIT), Kharagpur

Q94. 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 conditions is your answer.

Number\Symbol	**6**	**8**	**4**	**•**	**5**	**#**	**%**	**2**	**$**	**1**	**^**	**7**	**9**	**•**	**@**
Code	S	U	T	W	N	P	V	D	A	Z	J	M	O	M	Y

Conditions:

(i) If the first and last elements are numbers, then the last element will be replaced by the symbol @.

(ii) If the first element is a symbol, then the first element will be coded as ©.

(iii) If both the first and second elements are numbers, then the third element will be coded as *.

What will be the code for the following?

1 2 ^ % @

(a) VYJZD
(b) ZDJVY
(c) ZD*VY
(d) ZDYVJ

Q95. _____ is the largest state in India by land area.

(a) Uttar Pradesh
(b) Madhya Pradesh
(c) Rajasthan
(d) Maharashtra

Q96. Which of the following aqueous solutions undergoes electrolysis to form sodium hydroxide?

(a) Na2SO4
(b) NaCl
(c) Na2O
(d) NaHCO3

Q97. A statement is followed by two conclusions. Find out which conclusion is true based on the given statement.

Statement:

G > A ≥ B ≥ C > D ≤ E ≤ F

Conclusions:

I. A > E

II. B ≤ F

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

Q98. In this question, the statement is followed by four conclusions. Find out which conclusion is true based on the given statement:

A ≥ B, C ≤ D, B = D > E

(a) E < A
(b) D ≥ A
(c) E > B
(d) B < C

Q99. The correct chemical-formula of washing soda is:

(a) Na2CO3.12H2O
(b) Na2CO3.8H2O
(c) Na2CO3.6H2O
(d) Na2CO3.10H2O

Q100. Simplify the given expression.

$(x - y)^3 + (x + y)3 + 3(x - y)(x^2 - y^2) + 3(x + y)(x2 - y2)$

(a) $4x^3$
(b) 6x3
(c) x3
(d) 8x3

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ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) 486.648

Given:

345.08 + 56.02 + 44.44 × 2.2 - 12.22.

Formula used:

BODMAS rule,

Calculation:

345.08+56.02+44.44×2.2-12.22; = 345.08+56.02+97.768-12.22; =498.868-12.22; =486.648

Hence the value of the expression is 486.648.

Q2. Answer: (a) Only conclusion 2 follows.

Given:

Statements:

All pens are pencils.

No pencil is a cutter.

All cutters are rubbers.

Venn Diagram:

Conclusions:

1. All rubbers are pencils. → False (As there is no direct relationship between rubber and pencil so we can not say anything in a definite sense about their relation.)

2. No pen is a cutter. → True (As all pens are pencils that's why the pen is contained in a pencil and we have no pencil is a cutter. So no pen is a cutter is true.)

Hence, the correct answer is Only conclusion 2 follows.

Q3. Answer: (a) ten degree

The correct answer is ten degree.

Key Point

• Ten degree is a channel that separates the Andaman Islands and Nicobar Islands from each other in Bay of Bengal.

• The two sets of Islands together form the Indian Union Territory (UT) and Andaman and Nicobar Islands.

• This channel is 150 km wide from north to south and approximately 10 km long from east to west.

• It has minimum depth of 7.3 m and lies from east to west on the 10 degree line of latitude north of the equator.

Q4. Answer: (b) Mumbai

The correct answer is Mumbai.

Key Points

• State Bank of India (SBI) is an Indian multinational public sector bank and financial body headquartered in Mumbai,

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Maharashtra.

• SBI is the 49th largest bank in the world by total assets.

• It ranked 221st in the Fortune Global 500 list of the world's biggest corporations of 2020.

• Additional Information

• The roots of the State Bank of India lie in the first decade of the 19th century when the Bank of Calcutta later renamed the bank of Bengal, was established on 2 June 1806.

• SBI has 16 regional hubs and 57 zonal offices that are located at important cities throughout India.

Q5. Answer: (d) U

Given:

Five laptop boxes marked with Z, X, W, V, and U are kept one above the other

• U is kept third from the top.

• W is neither the topmost nor the bottom-most box.

• W is kept immediately above V.

• Z is kept immediately below X.

From the above arrangement, Box U is kept Immediately below Z.

The correct answer is 'U'.

Q6. Answer: (a) If three elements are arranged in the decreasing sequence of atomic masses, then atomic mass of the third e...

The correct answer is option 1.

Key Points

• Dobereiner stated in his law of triads that the arithmetic mean of the atomic masses of the first and third element in a triad would be approximately equal to the atomic mass of the second element in that triad.

• He also suggested that this law could be extended for other quantifiable properties of elements, such as density.

• Statement in option 1 actually contradict the statement of Dobereiner law hence it is not correct about Dobereiner law.

Additional Information

• If three elements are arranged in the decreasing sequence of atomic masses, then atomic mass of the Second Element is approximately the average of the atomic masses of the other two elements.

• Cl, Br and I constitute Dobereiner’s triads.

• the atomic mass of Br will be average of the atomic masses of Cl & I.

• mass of Cl + mass of I = (35.5+127)/2 = 81.25 = mass of Br

• Li, Na and K constitute Dobereiner’s triads.

• the atomic mass of Na will be average of the atomic masses of Li & K.

• mass of Li + mass of K = (7+ 39)/2= 23 = mass of Na

• If three elements are arranged in the increasing sequence of atomic masses, then atomic mass of the middle element is approximately the average of the atomic masses of the other two elements.

Q7. Answer: (b) Ministry of AYUSH

The correct answer is Ministry of AYUSH.

Key Points

• ICMR and CCRAS, Ministry of Ayush collaborated to create CTRI's Ayurveda Dataset.

• The WHO International Clinical Trials Registry Platform (ICTRP) uses CTRI as its principal register of clinical trials (WHO).

• The ability to choose an Ayurveda health condition from a list of 3866 Ayurveda morbidity codes is a vital function of this digital platform.

• The NAMASTE portal's codes have been included (developed by AYUSH Ministry).

• The Indian registry for clinical trials of Ayurveda will make the information and outcomes of these studies available in Ayurvedic language.

Q8. Answer: (d) 192

Given:

• Potential Difference = V =240

• Power of each Bulb = P = 10 W
• Current = I = 8 A
Formula Used:
• Power Formula $P=I^2R$
• Ohm's law V=IR
Solution :
Let the number of bulb be n
The resistance of each bulb can be calculated using the expression,
$P = (V^2)/R$
$R = (V^2)/P$
Substituting the values, we get
$R= ((240)^2)/10$
= * 5760 Ω *
*T*he Resistance of each bulb is 5760
The flow of 8 A current is, we need to find the equivalent resistance of the circuit,
According to Ohm’s law,
V = I R
I = V/R1
= 240over8
R1 = 30 Ω
we know that,
in parallel combination
equivalence resistance (Re) is given by,
1/R = 1/R1+ 1/R2+ 1/R3+....n
n = R/R1
n=5760/30 =192
therefore, 192 Bulbs can be connected in parallel.
The correct answer is '192'.

Q9. Answer: (a) Burnt lime

The correct answer is Burnt Lime
Key Points
• When calcium carbonate is heated, it decomposes to form calcium oxide and carbon dioxide
• Calcium carbonate reacts to form Calcium oxide, a white solid commonly known as lime, when it decomposes at temperatures above 840°C.
• Calcium oxide (CaO), commonly known as burnt lime or quicklime.
• Carbon dioxide is released as a gas when calcium carbonate decomposes, playing a key role in the process.
• This process is called thermal decomposition or calcining. It's reversible, but above 1200 K, the opposite reaction occurs.
Additional Information
• Limestone
• It is a carbonate sedimentary rock that's made up of calcite and aragonite, which are different crystal forms of calcium carbonate.
• Calcium carbonate is also known as limestone, chalk, or marble.
• It's a white, fluffy powder that's insoluble in water.
• It is used in the building industry as a raw material for cement and in the production of lime (calcium oxide).

Q10. Answer: (a) One

Given word:
ABSENT
There is only one pair in alphabetical order,
Hence, the correct answer is 'One'.

Q11. Answer: (b) South-west

Given:

• Pinto went 12 km to the south from his house

• then he turned east and covered 8 km

• then he turned north and covered 6 km

• Finally tuning to the west, he covered 13 km.

Now, according to the given information direction and distance diagram is shown below:

Now, finally Pinto is in the South-west direction from his house.

Hence, the correct answer is 'South-west'.

Q12. Answer: (a) KALM

The correct order of words as they would appear in an English dictionary when reversed:

1. KALM (MLAK)
2. LOST (TSOL)
3. SHAW (WAHS)
4. TALK (KLAT)
5. WALK (KLAW)

Thus, the order is: KLAT, KLAW, MALK, TSOL, WAHS

Thus, KALM will come in the middle position.

Hence, the correct answer is "Option 1".

Q13. Answer: (c) Indu

Given:

• Five people, Zunaid, Riya, Hema, Indu, and Jagan are sitting around a circular table facing the center.

• Zunaid is sitting second to the left of Indu.

• Hema is sitting second to the right of Riya.

Case I:

Case II:

• Jagan is not an immediate neighbour of Zunaid.

So, Indu is sitting third right to Riya.

Hence, the correct answer is 'Indu'.

Q14. Answer: (a) Either a concave mirror or a convex lens

The correct answer is Either a concave mirror or a convex lens

Key Points

• Concave Mirror:

• A concave mirror is a mirror with an inward-curved reflective surface.

• When a point source of light is placed at the focal point of a concave mirror, the reflected rays will travel parallel to the principal axis.

• This happens because the rays coming from the point source at the focal point reflect off the mirror in such a way that they become parallel after reflection.

• So, the concave mirror is able to produce a parallel beam of light when the point source is at its focal point.

• Convex Lens:

• A convex lens is a lens that is thicker in the middle than at the edges.

• If a point source of light is placed at the focal point of a convex lens, the rays passing through the lens will diverge after passing through, but they can be treated as parallel rays on the other side of the lens.

• The reason is that the convex lens causes light rays to bend inward (converge) when they pass through it. If the light source is at the focal point, the rays emerging from the lens will be parallel to each other and to the principal axis.

• Therefore, a convex lens can also produce a parallel beam of light when the point source is at the focal point.

Q15. Answer: (c) 65

The correct answer is 65

Key Points

• According to the Constitution of India, a Supreme Court judge can hold office until they reach the age of 65.

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• The Constitution also states that a Supreme Court judge can be removed from office by the President if:
• There is an address from each House of Parliament
• The address is supported by a majority of the total membership of that House
• The address is supported by a majority of at least two-thirds of the members present and voting
• The address is presented to the President in the same Session
• The ground for removal is proved misbehavior or incapacity

Q16. Answer: (a) 462000

Shortcut Trick

Apply the algebraic identity: $a^2 - b^2 = (a + b)(a - b)$.

Here, a = 731 and b = 269.

Sum (a + b) = 731 + 269 = 1000.

Difference (a − b) = 731 − 269 = 462.

Product = 1000 × 462 = 462000.

Therefore The correct answer is 462000.

Alternate Method

Given:

Expression: $(731)^2 - (269)^2$

Formula Used:

The difference of squares formula: $a^2 - b^2 = (a + b)(a - b)$

Calculations:

=> $(731)^2 - (269)^2$

=> (731 + 269) × (731 − 269)

=> (1000) × (462)

=> 462000

Therefore The correct answer is 462000.

Additional Information

Difference of Squares

The identity $a^2 - b^2 = (a + b)(a - b)$ is one of the most efficient ways to solve problems involving the subtraction of two squares, avoiding large multiplications.

Square of a Sum

The expansion of $(a + b)^2 = a^2 + 2ab + b^2$ is used for squaring sums.

Square of a Difference

The expansion of $(a - b)^2 = a^2 - 2ab + b^2$ is used for squaring differences.

Q17. Answer: (b) It is a straight line with slope +1/f, and +f is the x-intercept and -1 is the y-intercept.

The correct answer is It is a straight line with slope +1/f, and +f is the x-intercept and -1 is the y-intercept..

Key Points

• The magnification (m) of a concave mirror is given by the formula m=v/u ,where v is the image distance and u is the object distance.
• Using the mirror formula 1/f=1/u+1/v f=1u+1v1f=1u+1v, we can derive the relationship between magnification and object distance.
• Rearranging the magnification formula, we get v=mu
• Substituting into the mirror formula, we get 1/f=1/u+1/mu=>1/m=u/f-1.
• The question has asked for a graph between u and 1/m. Comparing with the equation of straight line: y=mx+c
• It is a straight line with slope +1/f, and +f is the x-intercept and -1 is the y-intercept.

Additional Information

• Mirror Formula:
• The mirror formula is given by 1/f=1/u+1/v, where f is the focal length, u is the object distance, and v is the image distance.
• This formula is applicable for both concave and convex mirrors, but the sign conventions differ.
• Magnification:
• Magnification (m) is defined as the ratio of the height of the image to the height of the object.
• For mirrors, magnification can also be expressed as the ratio of the image distance (v) to the object distance (u), i.e.,

m=vum=vum=vu.

• A positive magnification indicates an upright image, while a negative magnification indicates an inverted image.

• Graph of Magnification vs. Object Distance:

• When plotting magnification (m) against object distance (u), the slope of the line represents the reciprocal of the focal length (1/f).

• The x-intercept (object distance where magnification is zero) corresponds to the focal length (f).

• The y-intercept (magnification when object distance is infinite) is -1.

Q18. Answer: (a) 20 m, West

Given:

• Mohita starts walking from point O.

• She covered a distance of 30 m in west direction.

• She then turns left and cover a distance of 15 m.

• Then took a left turn and travel a distance of 10 m.

• Finally, she tooks left and cover a distance of 15 m.

Drawing direction and distance diagram according to the given information,

From the above diagram, Mohita is 20 m far and in the west direction from the starting point O.

Hence, the correct answer is '20 m, West'.

Q19. Answer: (d) 350

The pattern followed here is,

Hence, "350" is the correct answer.

Q20. Answer: (c) 2004

The correct answer is 2004.

Key Points

• The 92nd Constitutional Amendment Act, 2003, which was published in the Gazette of India on January 8th, 2004, added Bodo, Dogri, Maithili, and Santhali to the list of languages included in the Eighth Schedule of the Constitution of India.

• The Constitution was initially translated into 14 different languages back in 2004.

• There are now 22 languages included.

Additional Information

• Assamese, Bengali, Gujarati, Hindi, Kannada, Kashmiri, Konkani, Malayalam, Manipuri, Marathi, Nepali, Oriya, Punjabi, Sanskrit, Sindhi, Tamil, Telugu, Urdu, Bodo, Santhali, Maithili, and Dogri are only some of the 22 languages in this group.

• In 1967, support for Sindhi was implemented.

• As of 1992, support was added for Konkani, Manipuri, and Nepali.

• An additional four languages, Bodo, Dogri, Maithili, and Santhali, were included in 2004.

Q21. Answer: (d) 205

Shortcut Trick

For moderately skewed data, use the Empirical Relation: Mode = 3 Median − 2 Mean.

Mode = 3(216.6) − 2(222.4)

Mode = 649.8 − 444.8 = 205.

Therefore The correct answer is 205.

Alternate Method

Given:

Mean = 222.4

Median = 216.6

Formula Used:

Empirical Formula: Mode = 3 × Median − 2 × Mean

Calculations:

=> Mode = 3 × 216.6 − 2 × 222.4

=> Mode = 649.8 − 444.8

=> Mode = 205

Therefore The correct answer is 205.

Additional Information

Symmetrical Distribution

In a perfectly symmetrical distribution, the Mean, Median, and Mode are all equal (Mean = Median = Mode).

Karl Pearson's Coefficient of Skewness

Skewness can be calculated as: Sk = (Mean − Mode) ÷ Standard Deviation or Sk = 3(Mean − Median) ÷ Standard Deviation.

Types of Skewness

Positive Skew: Mean > Median > Mode. Negative Skew: Mean < Median < Mode.

Q22. Answer: (c) 27

Shortcut Trick

Volume of a cube is proportional to the cube of its side length (V prop. to a^3).

If the side is increased by n times, the volume increases by n^3 times.

Given side becomes 3 times → Volume becomes 3^3 times.

$3^3 = 3 \times 3 \times 3 = 27$.

Therefore The correct answer is 27 times.

Alternate Method

Given:

Initial side of the cube = a

New side of the cube = 3a

Formula Used:

Volume of a cube (V) = $(Side)^3$

Calculations:

=> Initial Volume (V1) = a^3

=> New Volume (V2) = $(3a)^3$

=> V2 = $3 \times 3 \times 3 \times a^3$

=> V2 = $27a^3$

=> Ratio of volumes = V2 / V1 = $27a^3 / a^3 = 27$

Therefore The correct answer is 27 times.

Additional Information

Surface Area Change

Total Surface Area = $6a^2$. If side becomes n times, Surface Area becomes n^2 times (here $3^2 = 9$ times).

Diagonal of Cube

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

Volume of Cuboid

For a cuboid with dimensions L, B, and H, Volume = L × B × H.

Q23. Answer: (a) 20.8%

Shortcut Trick

Net discount for two successive discounts a% and b% is calculated as (a + b − ab ÷ 100)%.

Here, a = 10% and b = 12%.

Net discount = 10 + 12 − (10 × 12) ÷ 100 = 22 − 1.2 = 20.8%.

Therefore The correct answer is 20.8%.

Alternate Method

Given → First Discount = 10%, Second Discount = 12%. Formulas: Net Discount = [1 − (1 − d1÷100) × (1 − d2÷100)] × 100.

=> Let the Marked Price (MP) be 100.

=> After 10% discount, Price = 100 − 10 = 90.

=> After 12% discount on 90, Price = 90 − (12% of 90) = 90 − 10.8 = 79.2.

=> Total Discount = 100 − 79.2 = 20.8.

=> Net Discount% = (20.8 ÷ 100) × 100 = 20.8%.

Therefore The correct answer is 20.8%.

Additional Information

Successive Discounts

When multiple discounts are applied one after another, the base for the subsequent discount is the value obtained after the previous discount.

Marked Price & Selling Price

Selling Price = Marked Price × (100 − d1)% × (100 − d2)%.

Q24. Answer: (b) virus

The correct answer is 'Virus'.

Key Points

• Acquired immunodeficiency syndrome (AIDS) is a chronic, potentially life-threatening condition caused by the human immunodeficiency virus (HIV). By damaging your immune system, HIV interferes with your body's ability to fight infection and disease.

• HIV is a sexually transmitted infection (STI). It can also be spread by contact with infected blood and from illicit injection drug use or sharing needles. It can also be spread from mother to child during pregnancy, childbirth or breastfeeding. Without medication, it may take years before HIV weakens your immune system to the point that you have AIDS.

• There's no cure for HIV/AIDS, but medications can control the infection and prevent progression of the disease. Antiviral treatments for HIV have reduced AIDS deaths around the world, and international organizations are working to increase the availability of prevention measures and treatment in resource-poor countries.

• Alternative Names - HIV infection Infection - HIV; Human immunodeficiency virus; Acquired immune deficiency syndrome: HIV-1.

Additional Information

• Fungus:

• Numerous harmful fungus are parasitic on people and have been linked to both human and animal diseases.

• Parasitic fungus most frequently enter the human body through an epidermal wound (skin).

• Examples of fungal diseases: Ringworm, Athlete's feet, Candida infection, Vaginal Candidiasis, etc.

• Myobacterium:

• In the phylum Actinomycetota, the genus Mycobacterium has more than 190 species, each belonging to the Mycobacteriaceae family.

• This genus contains pathogens that are known to cause significant illnesses in mammals.

• Examples: Leprosy (M. leprae) in humans and Tuberculosis (M. tuberculosis) in humans.

• Bacterium:

• The term harmful bacteria refers to bacteria that make people sick.

• Bacterial infections are contagious diseases and pass from one person to another.

• Examples: Diptheria, Cholera, Leprosy, etc.

Q25. Answer: (b) 138

Decoding the information,

The sign "÷" and "-" are interchanged.

Given:

18 - 6 + 14 × 10 ÷ 5

After replacing the signs and using the BODMAS rule,

18 ÷ 6 + 14 × 10- 5; =3+14 × 10- 5; =3+140-5; =143-5; =138

Hence, the correct answer is '138'.

Q26. Answer: (a) PAIR : QZJQ

The position of letters according to the the English alphabet series is,

The pattern followed here is,

LINE : MHOD

And,

GOAT : HNBS

Similarly,

PAIR : QZJQ

Hence, the pair "PAIR : QZJQ" follows the same logic.

Q27. Answer: (c) 135

Shortcut Trick

For two numbers a and b, the third proportional is given by the formula b^2/a.

Here a = 60 and b = 90.

Third proportional = (90 × 90) ÷ 60

Third proportional = 8100 ÷ 60 = 135.

Therefore The correct answer is 135.

Alternate Method

Given: First number (a) = 60, Second number (b) = 90.

Formula Used: If x is the third proportional to a and b, then a : b :: b : x.

=> 60 ÷ 90 = 90 ÷ x

=> 60 × x = 90 × 90

=> 60x = 8100

=> x = 8100 ÷ 60

=> x = 135

Therefore The correct answer is 135.

Additional Information

Mean Proportional

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

Fourth Proportional

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

Continued Proportion

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

Q28. Answer: (a) sec A cosec A + 1

Shortcut Trick

Put A = 45° to check the expression value (this results in 0/0, so avoid it).

Put A = 30°: tan 30° = 1/√3 and cot 30° = √3.

Value = [(1/√3)/(1−√3)] + [√3/(1−1/√3)] = [1/(√3−3)] + [3/(√3−1)].

Solving this gives (2/√3) + 1, which is sec 30° cosec 30° + 1 = (2/√3 × 2) + 1 is not it. Let's use sec A cosec A + 1 = (2/√3 × 2) + 1 = 4/√3 + 1.

Therefore The correct answer is sec A cosec A + 1.

Alternate Method

Given: Expression = [tan A / (1 − cot A)] + [cot A / (1 − tan A)]

Formula Used: tan A = sin A / cos A; cot A = cos A / sin A; $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$

=> Expression = [tan A / (1 − 1/tan A)] + [cot A / (1 − tan A)]

=> Expression = [$\tan^2$ A / (tan A − 1)] − [cot A / (tan A − 1)]

=> Expression = [$\tan^2$ A / (tan A − 1)] − [1 / (tan A(tan A − 1))]

=> Expression = ($\tan^3$ A − 1) / [tan A (tan A − 1)]

=> Expression = [(tan A − 1)($\tan^2$ A + tan A + 1)] / [tan A (tan A − 1)]

=> Expression = ($\tan^2$ A + tan A + 1) / tan A = tan A + 1 + cot A

=> Expression = (sin A / cos A) + (cos A / sin A) + 1 = ($\sin^2$ A + $\cos^2$ A) / (sin A cos A) + 1

=> Expression = 1 / (sin A cos A) + 1 = sec A cosec A + 1

Therefore The correct answer is sec A cosec A + 1.

Additional Information

Trigonometric Identities

Primary identities: $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Reciprocal Relations

sec θ = 1/cos θ, cosec θ = 1/sin θ, and cot θ = 1/tan θ.

Substitution Method

For proving identities, substituting specific angles (like 30°, 45°, 60°) can quickly verify the options if no undefined terms occur.

Q29. Answer: (d) 38

The pattern followed here is shown below,

Hence, "38" is the correct answer.

Q30. Answer: (c) 9

The figure given below,

The total number of triangles in above figure is 9.

Hence, the correct answer is '9'.

Q31. Answer: (d) originate from its north pole and end at its south pole

The correct answer is originate from its north pole and end at its south pole.

Key Points Magnetic field lines are imaginary lines. Magnetic field lines are a visual tool used to represent magnetic fields. They describe the direction of the magnetic force on a north monopaole at any given position. The density of the lines indicates the magnitude of the field.

• A freely suspended magnet always point in North direction because Earth itself behaves as a magnet.

• The shape of earth's magnetic field resembles that of imaginary bar magnet of length 1/5th of earth's diameter buried at its Centre.

• The South pole of earth's magnet is in geographical north because it attracts the north pole of suspended magnet.

• Similarly, the North Pole of Earth's magnet is in geographical south because it attracts the south pole of the suspended magnet.

• The axis of earth's magnetic field is inclined at an angle of 15° with its geographical axis.

• The earth's magnetism is due to magnetic effect of current which is flowing in the liquid core at the Centre of the earth.

• The north end of the magnet is attracted to the south magnetic pole, which is located near the geographic north pole.

• Magnetic field lines outside a permanent magnet always run from the north magnetic pole to the south magnetic pole.

Q32. Answer: (c) YXCY

Given: SX_ABS_YBBSXY_BSX_DB

Let's check each option:

1. XCCY →

2. CXYX →

3. YXCY →

4. XCYC →

So, by putting option 3 in the series 'SXYA, B, C, DB is repeating itself.

Hence, the correct answer is "YXCY".

Q33. Answer: (d) C

The hardest natural allotrope is C.

Key Points

• Diamond is a well-known allotrope of carbon that exhibits hardness and high dispersion of light. It is the hardest known natural mineral/substance and finds applications in cutting, drilling, and jewelry, and as a potential semiconductor material.

• Diamond has a crystalline lattice in which each carbon atom is sp^3 hybridized.

• Each carbon atom is linked to four other carbon atoms and the C-C bond length is 154 pm.

• The structure extends in space and produces a rigid 3-D network of carbon atoms with directional covalent bonds throughout the lattice.

• It is very difficult to break extended covalent bonding which makes diamond the hardest substance on the earth.

Additional Information

• Allotropy is the presence of the same element in two or more different physical states with varying attributes.

• These different states are known as allotropes.

• Pb:

• Pb or Lead has no such secondary structure.

• Thus, Pb has no allotropes.

• S:

• There are numerous allotropes of the element sulphur.

• Sulfur is the second most abundant allotrope after carbon.

• Each allotrope moreover frequently exists in polymorphs in addition to the allotropes.

• Sn:

• Sn or Tin have two different forms or allotropes.

• Allotropes of Sn are: White Tin (beta) and Grey Tin (alpha).

Q34. Answer: (c) 25

The logic followed here is:

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

Now,

For, 10 : 21

=> (10 × 2) + 1 = 20 + 1 = 21.

For, 11 : 23

=> (11 × 2) + 1 = 22 + 1 = 23.

Similarly, for 12 : ?

=> (12 × 2) + 1 = 24 + 1 = 25.

Hence, the correct answer is "Option 3".

Q35. Answer: (a) Spectacles

The correct answer is 'Spectacle'.

Key Points

• Refraction in simple terms is the bending of light when it passes from one transparent substance to another. It also happens with water, sound and other waves. Due to this bending, which causes refraction of light, we are able to have magnifying glasses, prisms, lenses and rainbows. Our eyes would not be able to focus, without the refraction of light.

• Principle of Refraction light

• The reflected ray, incident ray and the normal to the interface of the two media at the point of incidence all lie on the same plane.

• The ratio of the sine of the angle of refraction to the sine of the angle of incidence is a constant. This is also known as Snell's law of refraction.

• Spectacles work by bending light i.e. on the the principle of Refraction just like the lens and cornea in eye. The Spectacles bends light to make it focus correctly on retina (the light-sensitive layer of tissue at the back of the eye). Different eyeglass lenses can correct different errors caused by problems with the cornea, lens, or shape of the eye.

Q36. Answer: (c) Gender Equality Today for a Sustainable Tomorrow

The correct answer is Gender Equality Today for a Sustainable Tomorrow.

Key Points

• The theme for International Women's Day 2022 (IWD 2022) is "Gender equality today for a sustainable tomorrow."

• This theme recognises the contribution of women and girls around the world, who are taking the initiative to combat climate change and help future generations adapt, mitigate, and respond.

• The International Women's Day topic corresponds to the primary theme of the 66th Commission on the Status of Women (CSW66).

Q37. Answer: (d) Neither I nor II is embedded

Given Statement: Due to ongoing road work, all traffic on Road X is being diverted to the Airport Road.

Now,

Assumptions:

1. There is heavy traffic jam on the Airport Road - Not Implicit (The statement does not provide enough information to conclude that there is a traffic jam on the Airport Road)

2. Flights are being rescheduled because people are not able to reach the airport on time - Not Implicit (The statement does not mention any information about flight schedules being affected)

Here, Neither assumption I nor II is implicit.

Hence, the correct answer is "Option 4".

Q38. Answer: (a) Sarnath

The correct answer is Sarnath.

Key Points

• Buddhism, one of the world's largest religions, has its roots in India and stretches back 2,500 years.

• Medieval Buddhist art frequently featured the Buddha's first sermon, which was delivered in a deer woodland.

• The term "Dhamma Chakka Pavattana," which means "spinning the wheel of dharma," refers to this occasion.

• The Buddha gave his first lecture in a deer forest at Sarnath, north of Bodhgaya, where he had attained enlightenment weeks before, is a common motif in mediaeval Buddhist art.

Additional Information

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• Buddhists hold that enlightenment or nirvana can be attained via meditation, hard work both physically and spiritually, and good conduct. They also hold that human life is one of suffering.

• Buddhism is an Indian religion or philosophical school that is founded on teachings credited to the Buddha also known by the names Buddha Dharma and Dharmavinaya.

• With Siddhartha Gautama, it began in India about the fifth century BCE, and throughout the following millennia, it spread throughout Asia and the rest of the world.

Q39. Answer: (a) 42^(nd)

The correct answer is: 42nd

Key Points

• The 42nd Amendment Act of 1976 amended the Indian Constitution to include Fundamental Responsibilities.

• The USSR is where the idea of fundamental obligations originated.

• Indian tradition, mythology, faiths, and traditions are largely incorporated into the Fundamental Duties.

Additional Information

• Every citizen should always be reminded of their fundamental obligations even though the constitution explicitly associates certain fundamental rights with them.

• Because rights and duties are related, it also calls for citizens to adhere to some fundamental democratic principles.

• The addition of Basic Obligations brought our Constitution into compliance with both the provisions of various other modern constitutions as well as article 29 (1) of the Universal Declaration of Human Rights.

Q40. Answer: (a) Direction of induced current

The correct answer is the Direction of the induced current

Key Points

• Fleming's right-hand rule is used to determine the direction of the induced current in a conductor moving through a magnetic field.

• The rule states:

• Thumb: Direction of motion of the conductor (or the relative motion between the conductor and the magnetic field).

• Index finger: Direction of the magnetic field (from north to south).

• Middle finger: Direction of the induced current.

• Thus, the correct answer is: Direction of induced current.

Q41. Answer: (c) 328

Given :

104.96 + 120.96 + 103.16 - 12.89 × 2.04 + 124.93 ÷ 5.1 = ?

Formula used:

Calculation:

104.96 + 120.96 + 103.16 - 12.89 × 2.04 + 124.93 ÷ 5.1; =104.96+120.96+103.16-12.89× 2.04 +24.5; =104.96+120.96+103.16-26.3+24.5; =353.58-26.3; =327.73~328

Hence the closest approximate value is 328.

Q42. Answer: (a) Rs. 6 lakh

The correct answer is Rs. 6 lakh.

Key Points

• The scheme aims to empower students belonging to minority communities and prepare them for competitive examinations so that their participation in government and private jobs improves.

• The scheme provides financial support for free coaching to notified minority students in selected coaching institutions.

• The total family income from all sources NOT exceeding Rs. 6 lahks per annum, will be eligible under the Scheme.

Additional Information

• Qualifying examinations for admission in technical/professional courses such as engineering, law, medicine, management, information technology etc and language/aptitude examinations for seeking admission in foreign universities.

• Coaching for jobs in the private sector such as in airlines, shipping, information technology (IT), business process outsourcing (BPO) and other IT-enabled services, hospitality, tours and travels, maritime, food processing, retail, sales & marketing, biotechnology and other job oriented courses as per the emerging trend of employment.

• Remedial coaching at the undergraduate and postgraduate level to improve academic knowledge and enable the student to catch up with the rest of the class and complete the course successfully.

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Q43. Answer: (b) Manage it wisely

The correct answer is Manage it wisely.

Key Points

• Conservation of natural resources like water doesn't mean not using them.

• It means managing them wisely for their best use over time, including delaying use if delay preserves them for continuing use by future generations.

• A "natural resource" is an element of nature that has "utility" for humans — a utility that supports our life and wellbeing.

• But natural resources like water are not inexhaustible — the regenerative capability of renewable (biological) resources can be destroyed, and the economic cost of recovery of non-renewable can be exceeded.

• The objective of resource conservation is to support and expand our own quality of life without risking the future well-being of our children.

• We do that by making sure that we don't waste our resources on dumb stuff like endangered species harvesting, egregious material splendour, or weapons of destruction

Q44. Answer: (d) 150

Shortcut Trick

For a cube with side a, the Total Surface Area (TSA) is always $6a^2$.

Given a = 5 cm.

=> TSA = $6 \times (5)^2 = 6 \times 25 = 150$.

Therefore The correct answer is 150 cm^2.

Alternate Method

Given:

Side of the cube (a) = 5 cm

Formula Used:

Total Surface Area of a cube = $6 \times (side)^2$

Calculations:

=> Surface area of one face = $5 \times 5 = 25$ cm^2

=> Since a cube has 6 identical faces:

=> Total Surface Area = 6×25

=> Total Surface Area = 150 cm^2

Therefore The correct answer is 150 cm^2.

Additional Information

Volume of a Cube

The space occupied by the cube is given by a^3, where a is the side length.

Lateral Surface Area (LSA)

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

Diagonal of a Cube

The longest distance between two opposite corners of a cube is $a\sqrt{3}$.

Q45. Answer: (a) 1,19,333

Given:

Here a graph is given which represents the number of vehicles manufactured by companies A and B in 2001-2006.

Formula used:

Average = Sum of observations ÷ Number of observations

Calculation:

Total number of vehicles produced during the year 2001-2006 by company B = (119 + 99 + 141 + 78 + 120 + 159) × 1000 = 716000.

Number of years = 6.

Average number of vehicles = 716000 ÷ 6 = 1,19,333.

Hence, the average number of vehicles manufactured by company B is = 119333.

Q46. Answer: (b) 8

Shortcut Trick

To find the HCF, check the difference between the numbers or use divisibility rules on the options.

Difference = 2456 − 1248 = 1208.

The HCF must be a factor of 1208.

Checking options: 1208 is divisible by 8 (last three digits 208 ÷ 8 = 26), but not by 12, 14, or 16.

Therefore The correct answer is 8.

Alternate Method

Given: Numbers are 1248 and 2456.

Method: Long Division Method (Continued Division).

=> Divide 2456 by 1248:

=> 2456 = 1248 × 1 + 1208

=> Now divide 1248 by the remainder 1208:

=> 1248 = 1208 × 1 + 40

=> Now divide 1208 by 40:

=> 1208 = 40 × 30 + 8

=> Now divide 40 by 8:

=> 40 = 8 × 5 + 0

=> The last divisor which leaves remainder 0 is the HCF.

Therefore The correct answer is 8.

Additional Information

HCF (Highest Common Factor)

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

Relation between HCF and LCM

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

HCF of Fractions

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

Q47. Answer: (b) A - Because it pumps blood to different parts of the body B - Prevents back flow of blood

The correct answer is 'A- Because it pumps blood to different parts of the body and B - Prevents back flow of blood '.

Key Points

• The part A is left ventricle and the part B is Aortic Valve.

• Left ventricle:

• Out of all the compartments, the left ventricle has the thickest wall.

• The left ventricle is responsible for pumping the blood towards the different parts of the body

• Aortic valve:

• Enables blood to pass from the left ventricle to the aorta.

• It prevents backflow of blood into the left ventricle.

Additional Information

• Left ventricle:

• One of the heart's four chambers is the left ventricle.

• The mitral valve separates it from the left atrium in the bottom left corner of the heart.

• Blood eventually returns to the left atrium as the heart contracts, passes through the mitral valve, and then enters the left ventricle.

• Aortic valve:

• The aortic valve opens, allowing blood to flow into the aortic arch and then the rest of the body.

• The thickest chamber of the heart, the left ventricle is in charge of delivering oxygen-rich blood to tissues throughout the body.

• The right ventricle, in contrast, only pumps blood to the lungs.

Q48. Answer: (a) Embryo

Key Points

• A prenatal mammal or other viviparous vertebrate between its embryonic stage and birth is referred to as a foetus.

• A multicellular diploid eukaryote in its infancy, from fertilisation through birth, hatching, or germination, is called an embryo.

• The embryo begins to produce several organs, the nervous system, separate cell layers, and blood cells in the second week following fertilisation.

• Most organs have begun to form by the end of the embryonic stage, however they will still develop and grow during the following stage. (that of the fetus).

• The cells of the embryo continually go through mitosis as a result of all these changes, which enables the embryo to increase in size and complexity.

• Further it is developed into foetus.

Additional Information

• An embryo is an initial stage of development of a multicellular organism.

• Steps of embryo formation:

1. Embryonic development is the phase of life cycle that starts right after the male sperm cell fertilises the female egg cell in sexually reproducing animals.

2. The consequence of the union of these two cells is a single-celled zygote that divides numerous times to give rise to blastomere cells.

3. The blastomeres are structured as a solid ball, or morula, which when it reaches a specific size absorbs fluid to form a hollow, or blastocoel. It's structure is then known as a blastula, or a blastocyst in animals.

4. Before implanting into the endometrial lining of the womb, the mammalian blastocyst develops..

5. The embryo will continue to develop through the next stages of gastrulation, neurulation, and organogenesis after being implanted.

6. The three germ layers that will eventually give rise to all the various bodily components are formed during gastrulation.

7. The formation of all the various body tissues and organs is known as organogenesis, and neurulation is the process that creates the nervous system.

8. Up until the ninth week following conception, a developing person is commonly referred to as an embryo. following that point, it is called a foetus. The term "embryo" can refer more widely in other multicellular animals to any early developmental or life cycle stage that occurs before birth or hatching.

Q49. Answer: (d) 72

Decoding the information,

'+' means '×',

'-' means '÷',

'×' means '-' and

'÷' means '+'

Given:

11 + 35 - 5 × 8 ÷ 3

After replacing the signs and using the BODMAS rule,

11 × 35 ÷ 5 - 8 +3; =11 × 7-8+3; =77-8+3; =80-8; =72

Hence, "72" is the correct answer.

Q50. Answer: (b) Abnormal Profit

The correct answer is Abnormal profit.

Key Points

• Abnormal Profit:

• Abnormal profit occurs when the firm earns a higher-than-normal profit.

• It occurs when total revenue exceeds total economic costs (implicit costs plus explicit costs).

• It is also known as supernormal profit or economic profit which is when a firm's total sales revenue exceeds the total costs of production i.e., they are earning a profit above and beyond the level of normal profit.

• It is the "profit of a firm over and above what provides its owners with a normal (market equilibrium) return to capital that is of the opportunity cost of the factor input."

Additional Information

• Normal profit:

• Normal profit is a profit metric that takes into consideration both explicit and implicit costs.

• It may be viewed in conjunction with economic profit.

• Normal profit occurs when the difference between a company's total revenue and combined explicit and implicit costs are equal to zero.

• Regulated Profit:

• The optimum profit is the maximum profit level an individual attains.

• When the marginal revenue from the sale of a commodity is equal to the marginal cost of production, then an individual is at the optimum profit level.

• Opportunity costs:

• Opportunity costs are the costs of any opportunity a company or business owner didn't take, including rejecting a higher-paying job offer or choosing one return on investment option over another.

Q51. Answer: (c) Root

The correct answer is Root.

Key Points

• The given diagram consists of Cell wall, cytoplasm, nucleus, vacuoles hence it is of root hair cell which is in root.

• Cell Wall

• The root hair contains a cell wall made of an outer layer of pectin and an inner layer of cellulose. The function of root hairs is to collect water and mineral nutrients present in the soil and take this solution up through the roots to the rest of the plant. The cell wall is a dynamic structure that determines the shape of the root hair.

• Cytoplasm

• The cytoplasm is made up of water, salts and organic molecules. It is important as it suspends the cell organelles within it. All cells need energy to survive. Root hair cells are alive and therefore need energy, which is why root hair cells contain many mitochondria in them.

• Nucleus

• Nucleus is enclosed by a nuclear membrane with pores which allows selective passage of materials into and out of the nucleus. The nucleus contains nucleolus which synthesizes ribosomes and chromatin which contains the cell's genetic material. The nucleus controls all the cell activities, for example it controls the type of enzymes synthesized in the cytoplasm thus regulates the chemical changes which takes place in a cell.

• Vacuoles

• The root hair cell has a large vacuole which speeds up the movement of water to travel up the xylem and reach the cells.

Additional Information

• Seed (germination):

• Seed's external part consists of a seed coat and a small scar called hilum.

• While seed's internal part consists of 1 or 2 cotyledons, epicotyl, plumule and radical.

• Xylem:

• A tissue having several cell kinds.

• The conducting cells (vessels and tracheids) lack cytoplasm, nucleus, plastids, mitochondria, and vacuoles but are dead and hollow.

• However, the xylem also contains meristematic cambium cells.

• Large vacuoles impede the quick mitosis and cytokinesis occurring in these cells.

• At maturity, xylem fibre cells are dead but do not conduct. When they die, they form strong walls with a tiny amount of compacted mummified cytoplasm that fills the remaining interior space; if a dead vacuole were still present, it would be very thin.

• Particularly in xylem rays, xylem parenchyma cells feature "typical" cytoplasm with a full complement of operational organelles, which will include functional vacuoles.

• Shoot Tip:

• Plant roots and shoot tips contain a zone of multiplication and growth-capable cells called apical meristem.

• Their cytoplasm is thick and there are not many tiny vacuoles. (watery saclike enclosures).

Q52. Answer: (a) Rs. 4,96,125

Shortcut Trick

The effective rate of compound interest for 2 years at 5% = 5 + 5 + (5 × 5)/100 = 10.25%.

Total Amount = 100% (Principal) + 10.25% (Interest) = 110.25% of Principal.

Amount = 4,50,000 × 110.25 / 100 = 4,500 × 110.25.

Amount = Rs. 4,96,125.

Therefore The correct answer is Rs. 4,96,125.

Alternate Method

Given: Principal (P) = Rs. 4,50,000, Rate (R) = 5% per annum, Time (n) = 2 years.

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

=> $A = 4,50,000 \times (1 + 5/100)^2$

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=> A = 4,50,000 × (105/100) × (105/100)
=> A = 4,50,000 × (21/20) × (21/20)
=> A = 4,50,000 × (441 / 400)
=> A = 1,125 × 441
=> A = 4,96,125
Therefore The correct answer is Rs. 4,96,125.
Additional Information
Compound Interest Formula
Compound Interest (CI) is calculated using CI = P[(1 + R/100)^n − 1], where P is Principal, R is Rate, and n is Time.
Effective Interest Rate
For two years with annual compounding, the effective rate is given by R_(eff) = R + R + (R × R)/100.
SI vs CI Difference
The difference between CI and SI for 2 years is calculated as D = P(R/100)^2.

Q53. Answer: (c) R

Given word: SANITY
Code:
• The vowels are changed with the following letters.
• The consonants are changed with the preceding letters.
According to the given information,
After arranging the obtained code word into alphabetical order, we get BJMRSX.
Here, R is the fourth from the left side.
Hence, the correct answer is 'R'.

Q54. Answer: (b) $(2x + 3y)^3$

Shortcut Trick
Identify the perfect cubes in the expression: $8x^3 = (2x)^3$ and $27y^3 = (3y)^3$.
Since all terms are positive, the expression must follow the $(a + b)^3$ pattern.
Compare the coefficients of middle terms to verify: $3a^2b = 3(2x)^2(3y) = 36x^2y$ and $3ab^2 = 3(2x)(3y)^2 = 54xy^2$.
Both conditions are satisfied with a = 2x and b = 3y.
Therefore The correct answer is $(2x + 3y)^3$.
Alternate Method
Given Expression: $8x^3 + 27y^3 + 36x^2y + 54xy^2$
Formula Used: $(a + b)^3 = a^3 + b^3 + 3a^2b + 3ab^2$
=> Write the first term as a cube: $8x^3 = (2x)^3$
=> Write the second term as a cube: $27y^3 = (3y)^3$
=> Here, a = 2x and b = 3y.
=> Express the third term: $36x^2y = 3 \times (2x)^2 \times (3y) = 3 \times 4x^2 \times 3y$
=> Express the fourth term: $54xy^2 = 3 \times (2x) \times (3y)^2 = 3 \times 2x \times 9y^2$
=> The expansion matches the standard identity structure: $(2x)^3 + (3y)^3 + 3(2x)^2(3y) + 3(2x)(3y)^2$
=> Equivalent form = $(2x + 3y)^3$
Therefore The correct answer is $(2x + 3y)^3$.
Additional Information
Negative Cubic Expansion
The identity for $(a − b)^3$ is $a^3 − 3a^2b + 3ab^2 − b^3$, where signs alternate.
Sum and Difference of Cubes
Factorization of $a^3 + b^3$ is $(a + b)(a^2 − ab + b^2)$ and $a^3 − b^3$ is $(a − b)(a^2 + ab + b^2)$.
Algebraic Identities
Always verify the middle terms ($3a^2b$ and $3ab^2$) to ensure the expression fits the binomial cube pattern perfectly.

Q55. Answer: (b) 2 : 1

Shortcut Trick
Profit ratio is calculated as (Investment × Time).

Ratio of Investments (Ren : Martin) = 5 : 4.

Time period for Ren = 2 years = 24 months.

Time period for Martin = 15 months.

Profit Ratio = (5 × 24) : (4 × 15) = 120 : 60 = 2 : 1.

Therefore The correct answer is 2 : 1.

Alternate Method

Given → Investment ratio = 5 : 4 | Time for Ren = 24 months | Time for Martin = 15 months.

Formulas: Profit = Investment × Time | Profit_A : Profit_B = (I_A × T_A) : (I_B × T_B)

=> Let investments be 5x and 4x.

=> Ren's Profit Share = 5x × 24 = 120x.

=> Martin's Profit Share = 4x × 15 = 60x.

=> Ratio = 120x : 60x = 2 : 1.

Therefore The correct answer is 2 : 1.

Additional Information

Partnership Basics

In a partnership, if the investments are for different time periods, it is called a compound partnership. The profit is always shared in the ratio of the product of capital and time.

Calculating Investment or Time

If profit ratio and time ratio are known, the Investment ratio = (Profit ÷ Time). If profit ratio and investment ratio are known, the Time ratio = (Profit ÷ Investment).

Q56. Answer: (b) three to seven

The correct answer is three to seven.

Key Points

• EI - Nino is a complex weather system that appears once every three to seven years, bringing drought, floods and other weather extremes to different parts of the world including India.

• The system involves oceanic and atmospheric phenomena with the appearance of warm currents off the coast of Peru in the Eastern Pacific and affects weather in many places including India.

• EI - Nino is merely an extension of the warm equatorial current which gets replaced temporarily by the cold Peruvian current or Humbolt current.

• This current increases the temperature of the water on the Peruvian coast by 10^?C.

• This results in :

• The distortion of equatorial atmospheric circulation.

• Irregularities in the evaporation of seawater.

• Reduction in the number of plankton which further reduces the number of fish in the sea.

Additional Information

• Effect of EI Nino:

• El Nino results in the rise of sea surface temperatures

• It also weakens the trade winds of the affected region

• In India and Australia, it can bring about drought conditions. This affects crop productivity largely. It has been also observed at certain times, that EL Nino may not bring drought but cause heavy rainfall. In both cases, it causes heavy damage.

• However, in some other countries, it may result in a complete reversal, i.e., excessive rainfall.

• Mitigation of effects:

• Keeping a check on the sea surface temperatures

• Maintaining sufficient buffer stocks of food grains and ensuring their smooth supply

• Ensuring relevant support to the farmer community including economic help

• Alternative ways to be promoted such as the practice of sustainable agriculture

Q57. Answer: (b) Propanone

The correct answer is Propanone.

Key Points

• The IUPAC name of CH3COCH3 is propanone as the suffix used for the ketone group is -one and propane because the parent chain consists of three carbon.

• The structural formula of propane is:

Additional Information

• Preparation of Propanone:

• 2CH≡CH + 3H2O +Mg (at 420°C) → CH3COCH3+ CO2 +2H2

• From the above reaction, propanone can be prepared from ethyne by passing a mixture of ethyne and stream over a catalyst, magnesium at 420°C.

• Propanol:

• It consists of 3 carbon chain and 1 alcohol group (-OH bond)

• Chemical formula: CH3CH2CH2OH.

• Propanal:

• It consists of 3 carbon chain and 1 aldehyde.

• Chemical formula: CH3CH2CHO.

• Propene:

• It consists of 3 carbon chain and 1 double bond in between 2 carbons.

• Chemical formula: CH3CH=CH2.

Q58. Answer: (b) D

Given:

• Five students A, B, C, D, and E are sitting around a circular table facing the centre.

• A is an immediate neighbour of both B and E.

• B is sitting to the immediate right of C.

• C is sitting to the immediate right of D.

So, D is the immediate neighbour of C and E.

Hence, the correct answer is 'D'.

Q59. Answer: (d) Cuscuta

The correct answer is Cuscuta.

Key Points

• Cuscuta is a parasitic plant.

• Since Cuscuta does not have chlorophyll, it cannot synthesize its own food by photosynthesis.

• It uses the nutrients of host plants for its growth.

• Other parasitic plants are - Rafflesia, Viscum, Nuytsia floribunda.

• Parasitic plants cause damage to the host plant.

Additional Information

• Mango

• The scientific name of Mango is Mangifera Indica.

• It is a large fruit tree.

• Pitcher plant

• It belongs to carnivorous tree.

• It has the Ability to kill and digest insect.

• The leaves of the plants are converted to jug like pitcher.

• Cactus

• Cacti are plants that have succulent stems, pads or branches with scales and spines instead of leaves.

• Cactus pads are actually modified stems with a waxy coating.

Q60. Answer: (d) $x^2 + 7x - 12 = 0$

Shortcut Trick

A quadratic equation is formed using the relation: x^2 − (Sum of roots)x + (Product of roots) = 0.

Substitute Sum = −7 and Product = −12 into the formula.

$x^2 - (-7)x + (-12) = 0 \rightarrow x^2 + 7x - 12 = 0$.

Therefore The correct answer is $x^2 + 7x - 12 = 0$.

Alternate Method

Given:

Sum of roots (α + β) = −7

Product of roots (α × β) = −12

Formula Used:

The standard form of a quadratic equation given its roots is:

$x^2 - (\alpha + \beta)x + \alpha\beta = 0$

Calculations:

=> $x^2 - (-7)x + (-12) = 0$

=> $x^2 + 7x - 12 = 0$

The resulting quadratic equation is $x^2 + 7x - 12 = 0$.

Therefore The correct answer is $x^2 + 7x - 12 = 0$.

Additional Information

Nature of Roots

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

Relationship between Roots and Coefficients

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

Standard Form

The general form of a quadratic equation is $ax^2 + bx + c = 0$, where a, b, and c are constants and $a \neq 0$.

Q61. Answer: (b) 10%

Shortcut Trick

Let the Marked Price be 100.

After 15% discount, Price = 100 − 15 = 85.

Single equivalent discount of 23.5% means Final Selling Price = 100 − 23.5 = 76.5.

Discount on 85 = 85 − 76.5 = 8.5.

Value of x% = (8.5 ÷ 85) × 100 = 10%.

Therefore The correct answer is 10%.

Alternate Method

Given → First Discount (a) = 15%, Second Discount (b) = x%, Single Equivalent Discount = 23.5%.

Formulas: Successive Discount = a + b − (a × b) ÷ 100

=> 23.5 = 15 + x − (15 × x) ÷ 100

=> 23.5 − 15 = x − 0.15x

=> 8.5 = 0.85x

=> x = 8.5 ÷ 0.85

=> x = 10

Therefore The correct answer is 10%.

Additional Information

Successive Discounts

When two or more discounts are applied one after another, they are called successive discounts. The net discount percentage is always less than the sum of individual percentages.

Marked Price & Selling Price

Selling Price (SP) = Marked Price (MP) × (100 − d1)% × (100 − d2)% ... where d is the discount percentage.

Q62. Answer: (b) 85

Given:

[{(1690 - 934) × 5over6 + 815} ÷ 17]

Concept used:

Order of precedence in the BODMAS rule:

Calculation:

= [{(1690 - 934) × 5over6 + 815} ÷ 17]

= [{756 × 5over6 + 815} ÷ 17]

= [{630 + 815} ÷ 17]

= [1445 ÷ 17]

= 85

Hence, the correct answer is 85.

Q63. Answer: (a) 0

Given:

• Five boxes A, B, C, D, and E are kept one over the other.

• D is kept third from the bottom.

• E is placed immediately above C.

• Only one box is kept between D and C.

• There are only three boxes between B and C.

So, 0 boxes are placed between A and B.

Hence, the correct answer is '0'.

Q64. Answer: (a) Cash Reserve Ratio (CRR)

The Correct Answer isCash Reserve Ratio (CRR).

Key Points

• The cash reserve Ratio is a particular minimum amount of the total deposits of customers that needs to be maintained by the commercial bank as a reserve either is cash or as deposits with RBI.

• The CRR rate will be fixed as per the guidelines of the Central Bank.

• The amount specified as the Cash Reserve Ratio is held or reserved in cash or cash equivalents with RBI.

• CRR aims to ensure that banks do not run out of cash to meet their depositors' payment demands

Additional Information

• Objectives of Cash Reserve Ratio :

• A part of the bank's deposits is with the Reserve Bank of India, it ensures the security of the amount.

• It makes it readily available when customers want their deposits back.

• CRR helps in keeping inflation under control. At the time of high inflation in the economy, RBI increases the CRR, so that banks need to keep more money in reserves so that they have less money to lend further.

• At the time of high inflation, the government needs to ensure that excess money is not available in the economy.

• To that extent, RBI increases the Cash Reserve Ratio and the amount of money that is available with the banks reduces.

• This curbs the excess flow of money in the economy. When the government needs to pump funds into the system, it lowers the CRR rate, which in turn, helps the banks provide loans to a large number of businesses and industries for investment purposes.

• Lower CRR also boosts the growth rate of the economy.

Important Points

• The cash reserve is either stored in the bank's vault or is sent to the RBI.

• Banks do not get any interest in the money that is with the RBI under the CRR requirements.

• If the current CRR rate is 4%, a bank is required to store 4% of the total NDTL or the Net Demand and Time Liabilities in the form of cash.

• Statutory Liquidity Ratio or SLR, which can be maintained in either gold or cash, CRR needs to be maintained only in cash.

Q65. Answer: (b) 9

Shortcut Trick

Assume the number is 3 units (based on the denominator of 1/3).

The one-third part of the number is 1 unit.

Total sum = 3 units + 1 unit = 4 units.

Given: 4 units = 12 => 1 unit = 3.

Original number = 3 units × 3 = 9.

Therefore The correct answer is 9.

Alternate Method

Given: A number plus its 1/3^(rd) part equals 12.

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Formula Used: x + (x/n) = Result

Let the unknown number be x.

According to the problem:

=> x + x/3 = 12

=> (3 × x + x) ÷ 3 = 12

=> 4x ÷ 3 = 12

=> 4x = 12 × 3

=> 4x = 36

=> x = 36 ÷ 4

=> x = 9

Therefore The correct answer is 9.

Additional Information

Linear Equations in One Variable

Equations in the form ax + b = c, where x is the variable, are solved by isolating x using inverse arithmetic operations.

Fractional Parts

When a fraction (1/n) of a number is added to itself, the result is always (n+1)/n times the original number.

Ratio Method

Representing values as units based on the denominator of the fraction avoids complex LCM calculations and speeds up solving in competitive exams.

Q66. Answer: (b) Lala Lajpat Roy

The correct answer is Lala Lajpat Roy

Key Points

• Lala Lajpat Rai is known as "Punjab Kesari", which means "Lion of Punjab".

• He was a prominent figure in the Indian independence movement and a key player in the fight against British colonial rule.

• some other things about Lala Lajpat Rai:

• He was a member of the Lal Bal Pal trio.

• He was a founding member of the Punjab National Bank, established in 1894.

• He founded the Dayanand Anglo-Vedic school in Lahore in 1885.

• He established the Indian Home Rule League of America in New York in 1917.

• He established the Servants of People Society in Lahore in 1921.

• He participated in rallies against the Jallianwala Bagh Massacre, the Rowlatt Act, and the partition of Bengal.

Q67. Answer: (b) Two

The position of alphabet are,

Given:

• Each letter is changed to the next letter in the English alphabetical order.

Now, let us apply the code to each word,

1) BOOK

2) PAPER

3) BOAT

4) PINK

So, two words thus formed will have NO vowel.

Hence, the correct answer is 'Two'.

Q68. Answer: (c) Q

Given:

• Six students of class XII, Q, R, U, V, Y and Z, has an online medical entrance exam on a different day of a week, starting from Tuesday and ending on Sunday of the same week.

• None of them have the exam before U.

• Y has the exam immediately after U.

• V has the exam on Saturday and Z has the exam immediately before V.

• Q does not have the exam on Sunday.

So, Q has an exam on Thursday.

Hence, the correct answer is 'Q'.

Q69. Answer: (c) YNNRBG

Given:

Number/Symbol	6	^	8	@	4	#	9	$	1	&	3	•
Code	T	D	C	R	G	B	Y	H	N	J	P	L

Conditions for coding the group elements,

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

913@#4

Condition 1: Doesn't follow → As the first element is an odd number and the last element is an even number.

Condition 2: Follow → Third and second elements are odd numbers. Therefore, the third element is to be coded as the code for the second element.

Condition 3: Doesn't follow → First element is a number but the last element is also a number.

Hence, the code for "913@#4" is "YNNRBG".

Q70. Answer: (d) I - A; II - C; III - B

The correct answer is I - A; II - C; III - B.

Key Points

I.Heart is defined as an organ that pumps blood received from veins into arteries throughout the body.

II.Arteries are defined as the blood vessel that carries blood from the heart to the body.It carries blood with oxygen.

III. Veins are defined as the blood vessel that carries blood from the body to heart .It caries blood containing carbon-dioxide.

Additional Information

• Heart

• It is the primary organ of human's circulatory system.

• It contains four chambers made of muscles and powered by electric impulses.

• The blood pumped by heart which provides your body with the oxygen and nutrients it needs to function.

• Arteries

• They are responsible for the transportation of fluid.

• The arteries are the blood vessels that deliver oxygen-rich blood from the heart to the tissues of the body.

• Veins

• They are the parts of our circulatory system.

• They work together with other blood vessels and your heart to keep your blood moving.

• Veins hold most of the blood in your body.

Q71. Answer: (c) (36, 60)

Shortcut Trick

Numbers must be multiples of HCF 12 and their product must be 2160.

Check options: (36, 60) → Both are divisible by 12.

Product check: 36 × 60 = 2160.

Therefore The correct answer is (36, 60).

Alternate Method

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Given: Product = 2160, HCF = 12.

Formula Used: Product of two numbers = HCF × LCM | Let numbers be 12x and 12y (where x, y are co-prime).

=> Let the numbers be 12x and 12y.

=> 12x × 12y = 2160

=> 144xy = 2160

=> xy = 2160 ÷ 144

=> xy = 15

=> Possible co-prime pairs for (x, y) are (1, 15) and (3, 5).

=> If (x, y) = (1, 15), numbers are (12×1, 12×15) = (12, 180).

=> If (x, y) = (3, 5), numbers are (12×3, 12×5) = (36, 60).

Therefore The correct answer is (36, 60).

Additional Information

Fundamental Property

For any two numbers a and b, Product (a × b) = HCF(a, b) × LCM(a, b).

Co-prime Factors

If HCF is h, the numbers can be written as hx and hy, where HCF(x, y) = 1 (they are co-prime).

Number of Pairs

The number of possible pairs depends on the number of ways the product (xy) can be split into co-prime factors.

Q72. Answer: (a) 10%

Shortcut Trick

For half-yearly compounding, 1.5 years = 3 conversion periods.

Ratio of Amount to Principal (A:P) = 9261 : 8000.

Take cube root for 1 period: $\sqrt[3]{9261} : \sqrt[3]{8000} = 21 : 20$.

Growth rate per half-year = (21 − 20) / 20 × 100 = 5%.

Annual Rate = 5% × 2 = 10%.

Therefore The correct answer is 10%.

Alternate Method

Given: Principal (P) = Rs. 8,000, Amount (A) = Rs. 9,261, Time (T) = 1.5 years.

Formula Used: $A = P(1 + r/100)^n$, where r is the half-yearly rate and n is the number of half-years.

=> For half-yearly compounding, n = 1.5 × 2 = 3 periods.

=> $9261 = 8000 \times (1 + r/100)^3$

=> $9261 / 8000 = (1 + r/100)^3$

=> $(21 / 20)^3 = (1 + r/100)^3$

=> $21 / 20 = 1 + r/100$

=> $r/100 = 21/20 − 1 = 1/20$

=> r = 100 / 20 = 5% (per half-year)

=> Annual Rate = 5% × 2 = 10%.

Therefore The correct answer is 10%.

Additional Information

Compound Interest Frequencies

When compounded half-yearly, the rate is divided by 2 and time is multiplied by 2. For quarterly compounding, the rate is divided by 4 and time is multiplied by 4.

Effective Annual Rate (EAR)

The effective rate is the actual interest earned in a year. $EAR = [1 + (r/n)]^n − 1$, where n is the number of compounding periods per year.

Standard Powers for CI

Memorizing cubes up to 25 is helpful for 3-year or 3-period CI problems. For example, $20^3 = 8000$ and $21^3 = 9261$ are very common in banking exams.

Q73. Answer: (a) double displacement reaction

The correct answer is Double displacement reaction.

Key Points

• A double displacement reaction is a type of chemical reaction in which the reactant ions exchange places to form new products.
• Usually, a double displacement reaction results in precipitate formation.
• The chemical bonds between the reactants may be either covalent or ionic.
• Example of Double displacement reaction $Na_2S+2HCl \rightarrow 2NaCl+H_2S$.

Additional Information
1.When more than two reactants react together to form a new product, this type of reaction is known as a combination reaction.
2.A displacement reaction is the one wherein the atom or a set of atoms is displaced by another atom in a molecule.
3. oxidation-reduction (redox) reaction is a type of chemical reaction that involves a transfer of electrons between two species

Q74. Answer: (a) 20 years

Shortcut Trick
Total age after 4 years = 44 years.
Total present age = 44 − (2 × 4) = 36 years.
Reema is older, so Reema's age = (Sum + Difference) ÷ 2.
Reema's age = (36 + 4) ÷ 2 = 40 ÷ 2 = 20 years.
Therefore The correct answer is 20 years.
Alternate Method
Let Reema's present age be x years.
Seema's present age = (x − 4) years.
After 4 years:
=> Reema's age = x + 4
=> Seema's age = (x − 4) + 4 = x
According to the question:
=> (x + 4) + x = 44
=> 2x + 4 = 44
=> 2x = 40
=> x = 20
Therefore The correct answer is 20 years.
Additional Information
Age Difference Property
The difference between the ages of two people remains constant regardless of the number of years passed.
Sum of Ages Calculation
If the sum of ages of 'n' people is S after 't' years, then their Present Sum = S − (n × t).
Ratio based Age Problems
When ages are given in ratios, use the cross-multiplication method or equate the ratio units to the actual year difference.

Q75. Answer: (a) Nuclear energy

The correct answer is Nuclear energy.
Key Points
• Conventional Source of energy is defined as the energy sources that once exhausted, do not replenish themselves within a specific period are called conventional or non-renewable energy sources.
• For a long time, these energy sources have been used extensively to meet the energy demands.
• Nuclear energy is one of the most environmentally friendly conventional sources of energy as it produces fewer greenhouse gas emissions during the production of electricity in comparison to sources like coal power plants.
Additional Information
• Hydroelectricity
• It is a renewable energy source.
• Hydroelectricity uses the energy of running water, without reducing its quantity, to produce electricity.
• Natural resources
• The example of this sources are l wind, tides, solar, biomass, etc.
• They generate energy which is known as “Non-conventional resources“.
• These are pollution free and hence we can use these to produce a clean form of energy without any wastage.

• Biomass Energy

• It is generated from the living organisms.

• The example of biomass energy resources are plants,corns.

• The energy from these organisms can be burned to create heat or converted into electricity.

Q76. Answer: (d) Reserve Bank of India

The correct answer is Reserve Bank of India

Key Points

• The Reserve Bank of India (RBI) is the lender of last resort in India's monetary system.

• The RBI is India's central bank and is responsible for regulating the banking system, controlling monetary policy, and issuing banknotes.

• The RBI's role as the lender of last resort means that it can provide liquidity to banks that are solvent but temporarily facing liquidity issues.

• This can happen when no other bank is willing to extend credit to the bank in need.

• The RBI was established on April 1, 1935, and was originally privately owned. It was nationalized in 1949 and is now fully owned by the Government of India.

Additional Information

• some other banks in India:

• State Bank of India: A public bank that is one of the four largest Indian banks by total assets

• HDFC Bank: A private bank that is one of the four largest Indian banks by total assets

• ICICI Bank: A private bank that is one of the four largest Indian banks by total assets

• Kotak Mahindra Bank: A private bank that is one of the four largest Indian banks by total assets

• Bank of Baroda: A public bank that is the third largest nationalized bank in India

• Punjab National Bank: A public bank

• IndusInd Bank: A private bank

Q77. Answer: (a) (42, 48)

The logic followed here is:

Logic: (1st number ÷ 7) × 8 = 2nd number.

Now,

For, 63 : 72

=> (63 ÷ 7) × 8 = 9 × 8 = 72.

For, 28 : 32

=> (28 ÷ 7) × 8 = 4 × 8 = 32.

Not check all the options:

Option (1): 42 : 48

=> (42 ÷ 7) × 8 = 6 × 8 = 48.

Option (2): 40 : 48

=> (40 ÷ 7) × 8 = 5.714 × 8 = 45.71 (not 48).

Option (3): 56 : 63

=> (56 ÷ 7) × 8 = 8 × 8 = 64 (not 63).

Option (4): 64 : 56

=> (64 ÷ 7) × 8 = 9.143 × 8 = 73.14 (not 56).

Hence, the correct answer is "Option 1".

Q78. Answer: (d) 11

Given:

From the above-shaded portion of the diagram, we can conclude that the employees with MBA degrees are computer experts but are NOT engineers and also don't smoke

Hence, the correct answer is '11'.

Q79. Answer: (b) 4x2 + 3x - 5 = 0

Shortcut Trick

To find a quadratic equation whose roots are the reciprocals of the roots of $ax^2 + bx + c = 0$, simply swap the coefficients a and c.

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

Swap 5 and −4: $-4x^2 - 3x + 5 = 0$

Multiply the entire equation by −1 to standardize: $4x^2 + 3x - 5 = 0$

Therefore The correct answer is $4x^2 + 3x - 5 = 0$.

Alternate Method

Given: The quadratic equation is $5x^2 - 3x - 4 = 0$.

Let the roots of this equation be α and β.

=> Sum of roots (α + β) = −b/a = −(−3)/5 = 3/5

=> Product of roots (αβ) = c/a = −4/5

The roots of the new equation are 1/α and 1/β.

=> New Sum = 1/α + 1/β = (α + β) / αβ = (3/5) / (−4/5) = −3/4

=> New Product = (1/α) × (1/β) = 1/(αβ) = 1 / (−4/5) = −5/4

The formula for the required quadratic equation is: $x^2 - (\text{New Sum})x + (\text{New Product}) = 0$

=> $x^2 - (-3/4)x + (-5/4) = 0$

=> $x^2 + 3x/4 - 5/4 = 0$

=> $4x^2 + 3x - 5 = 0$

Therefore The correct answer is $4x^2 + 3x - 5 = 0$.

Additional Information

Sum and Product of Roots

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

Transformation of Equations

To obtain an equation with roots as k times the original roots, replace x with x/k. For reciprocal roots, replace x with 1/x.

Discriminant and Nature

The value $D = b^2 - 4ac$ determines if roots are real ($D \geq 0$) or imaginary ($D < 0$).

Q80. Answer: (b) Kerala

The correct answer is Kerala.

Key Points

• The Thrissur Pooram is an annual temple festival clasp in Thrissur, Kerala, India.

• It is a clasp at the Vadakkunnathan (Shiva) Temple in Thrissur annually on Pooram day.

• The day during the moon rises with the Pooram star in the Malayalam Calendar month of Medam.

• The carnival was begun by Raja Rama Varma, Maharaja of Cochin Sakthan Thampuran in 1798.

Additional Information

• However the presiding deity at Thiruvambadi is Lord Krishna, it is the second in the significant deity of Goddess Bhagavati that participates in the pooram.

• There are as well eight other temples participate, but some exclusive rights as part of pooram are vested with Paramekkavu and Thiruvambadi temples.

Q81. Answer: (a) 400 km

Shortcut Trick

Assume Total Distance = 4D. Then parts are 1D and 3D.

Total Time = Distance1/Speed1 + Distance2/Speed2

14 = D/25 + 3D/30 => 14 = D/25 + D/10

14 = (2D + 5D)/50 => 14 = 7D/50 => D = 100 km.

Total Distance = 4D = 4 × 100 = 400 km.

Therefore The correct answer is 400 km.

Alternate Method

Given:

Total time taken by Babli = 14 hours

Speed 1 (v1) = 25 km/h for 1/4 of distance (x/4)

Speed 2 (v2) = 30 km/h for 3/4 of distance (3x/4)

Formula Used:

Time = Distance ÷ Speed

Calculations:

=> Let total distance be x km.

=> (x/4)/25 + (3x/4)/30 = 14

=> x/100 + 3x/120 = 14

=> x/100 + x/40 = 14

=> (2x + 5x)/200 = 14

=> 7x/200 = 14

=> x = (14 × 200) / 7

=> x = 2 × 200 = 400 km

Therefore The correct answer is 400 km.

Additional Information

Average Speed

For two equal distances with speeds a and b, Average Speed = 2ab/(a+b). For unequal distances, use Total Distance / Total Time.

Relative Speed

Same direction: S1 − S2 | Opposite direction: S1 + S2.

Unit Conversion

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

Q82. Answer: (a) B

Given:

City's Name	2018-19 (In lakhs)	2020-21 (In lakhs)
A	78	92
B	61	84
C	71	92
D	72	95

Concept used:

Percentage of population growth = (population(2020-21)-population(2018-19))/(population(2018-19))×100

Calculation table:

City's Name	Population (2018-19)	Population (2020-21)	Calculation (population (2020-21)-population(2018-19))/(population(2018-19))×100	Growth Percentage
A	78	92	(92-78)/78×100	17.94%
B	61	84	(84-61)/61×100	37.70%
C	71	92	(92-71)/71×100	29.57%
D	72	95	(95-72)/72×100	31.94%

Thus, the highest percentage of population growth is in city B.

Q83. Answer: (b) five

The correct answer is Five.

Key Points

Central Government Act Article 243E in The Constitution Of India 1949 243E. Duration of Panchayats, etc

1. Every Panchayat, unless sooner dissolved under any law for the time being in force, shall continue for five years from the date appointed for its first meeting and no longer

2. No amendment of any law for the time being in force shall have the effect of causing dissolution of a Panchayat at any level, which is functioning immediately before such amendment, till the expiration of its duration specified in clause (1)

3. An election to constitute a Panchayat shall be completed.

1. (a) before the expiry of its duration specified in clause (1)

2. (b) before the expiration of a period of six months from the date of its dissolution: Provided that where the remainder of the

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period for which the dissolved Panchayat would have continued is less than six months, it shall not be necessary to hold any election under this clause for constituting the Panchayat.

4. A Panchayat constituted upon the dissolution of a Panchayat before the expiration of its duration shall continue only for the remainder of the period for which the dissolved Panchayat would have continued under clause (1) had it not been so dissolved

Q84. Answer: (c) 2 : 1

Shortcut Trick

The centroid of a triangle divides each median in the ratio 2 : 1.

The larger part (2 units) is from the vertex to the centroid.

The smaller part (1 unit) is from the centroid to the midpoint of the opposite side.

In ΔABC, A is the vertex and D is the midpoint of BC.

Therefore AG : GD = 2 : 1.

Therefore The correct answer is 2 : 1.

Alternate Method

Given: Triangle ABC, Median AD, Centroid G.

Formula Used: Centroid Theorem (Centroid divides median in 2 : 1 ratio).

=> In any triangle, the centroid (G) is the point of intersection of its medians.

=> A median is a line segment joining a vertex to the midpoint of the opposite side.

=> According to the Centroid Theorem, the centroid is located 2/3 of the distance from the vertex to the midpoint.

=> AG = (2/3) × AD

=> GD = AD − AG = AD − (2/3) × AD = (1/3) × AD

=> Ratio AG : GD = [(2/3) × AD] : [(1/3) × AD]

=> AG : GD = 2 : 1

Therefore The correct answer is 2 : 1.

Q85. Answer: (a) Reduce use of fluorine-based refrigerants

The correct answer is Reduce use of flourine-based refrigerants.

Key Points

• Ozone layer is situated in the upper part of the atmosphere which is called. stratosphere.

• This works as a shield absorbing ultraviolet radiation from the sun.

• This gas is continuously produced by the action of UV rays on molecular oxygen.

• Ozone depletion is the cause of gradual thinning of Earth's ozone layer by the release of chemical compounds containing chlorofluorocarbons (CFCs) which move upward and reach the stratosphere and degrade ozone releasing molecular oxygen.

• ozone depletion is occurring widely in the stratosphere,but it causes ice to melt in the antartica region.

Q86. Answer: (a) N and P

The correct answer is N and P.

Key Points

• Columns in the periodic table are called groups because of their similar chemical behavior.

• All the members of a group of elements have the same number of valence electrons and similar chemical properties.

• Here Nitrogen and Phosphorus belong to group 15 of the Modern Periodic table.

• As a result, they exhibit almost the same characteristics.

Additional Information

• Carbon(C) belongs to Group 14 and Chlorine (Cl) belongs to group 17.

• Lithium (Li) belongs to the group and Kriptanium(Kr) the group 18.

• Magnesium belongs to group 2 and Manganese(Mn) belongs to group 7.

Q87. Answer: (b) Simranjit Kaur

The correct answer is Simranjit Kaur.

Key Points

• Simranjit Kaur

• Simranjit Kaur Batth is an Indian amateur boxer from Punjab.

• She came up from an economically weaker family but has established a very bright career.

• She is representing India since the year 2011.

• In the year 2020, she also represented India in Boxing at Tokyo Olympics.
• She received the Arjuna Award 2021 for outstanding performance in the discipline of boxing.
Additional Information
• Bhavina Patel:
• Bhavina Hasmukhbhai Patel is a Parathelete and Table Tennis Player from Gujrat.
• At the Tokyo Summer Paralympics in 2020, she took home a silver medal in Class 4 Table Tennis.
• In 2021, she received Arjuna Award for outstanding performance in the discipline of Para-Table Tennis.
• Monika:
• One of the primary playmakers for the Indian women's hockey squad is Monika.
• She had played more than 150 matches representing India.
• She received Arjuna Award 2021 for her outstanding performance in the discipline of Hockey.
• Arpinder Singh:
• Arpinder Singh is an Indian Triple Jumper.
• At the Glasgow 2014 Commonwealth Games, he won a bronze medal.
• In 2018, he won a gold medal in the Asian Games.
• He was amongst the 35 Arjuna Award 2021 winners, Arpinder won the award for his outstanding performance in the discipline of athletics.

Q88. Answer: (b) 200 J

Given:
Voltage of the battery V=10 V ;
Current flowing through the lamp I=2A;
The time required t=10s
Formula used:
Joule described quantitatively is that the heat evolved per second, or the electric power loss, H, equals the current I multiplied with voltage V and the required time t.
H = VIt
Calculation:
Heat energy produced by the lamp is H=10×2×10; →H=200J
Hence the heat energy=200J.

Q89. Answer: (b) Rs. 16,000

Shortcut Trick
Since investments are equal, the profit ratio depends only on the time ratio.
Anil (9 months) : Sunil (12 months) => 9 : 12 = 3 : 4.
Total ratio sum = 3 + 4 = 7 units.
7 units = Rs. 28,000 => 1 unit = Rs. 4,000.
Sunil’s share = 4 units × Rs. 4,000 = Rs. 16,000.
Therefore The correct answer is Rs. 16,000.
Alternate Method
Given:
Investment of Anil = Investment of Sunil = P
Time period for Anil (T_A) = 9 months
Time period for Sunil (T_S) = 12 months (1 year)
Total annual profit = Rs. 28,000
Formula Used:
Profit Ratio = (Investment1 × Time1) : (Investment2 × Time2)
Calculations:
=> Profit Ratio (Anil : Sunil) = (P × 9) : (P × 12)
=> Profit Ratio = 9 : 12 = 3 : 4
=> Let Anil’s profit be 3x and Sunil’s profit be 4x
=> 3x + 4x = 28,000
=> 7x = 28,000

=> x = 28,000 ÷ 7 = 4,000

=> Sunil's share = 4x = 4 × 4,000

=> Sunil's share = Rs. 16,000

Therefore The correct answer is Rs. 16,000.

Additional Information

Basic Partnership Rule

In any business partnership, the Profit (P) is directly proportional to the product of Capital (C) and Time (T). Formula: P1 : P2 = C1T1 : C2T2.

Simple vs Compound Partnership

A Simple Partnership involves equal time periods for all partners. a Compound Partnership involves different capital investments for different time durations.

Working and Sleeping Partner

A Working Partner manages the business and may receive an extra salary, while a Sleeping Partner only provides capital and shares profit based on the investment ratio.

Q90. Answer: (b) The number of painters who are plumbers and also watchmen but not carpenters.

Given:

From the diagram, we can conclude that the region "13" represents the number of painters who are plumbers and also watchmen but not carpenters.

Hence, the correct answer is 'The number of painters who are plumbers and also watchmen but not carpenters.'.

Q91. Answer: (a) 2 : 20 : 15

Given:

The slope of the three graphs is 0.5,0.1,0.2.

The ratio of cross-section areas is 1:2:3

Formula used:

Electrical resistivity is the resistance of the flow of current from one end to the other in a material.

The resistivity formula is expressed as ρ=(R A)/l, Where ρ is the resistivity, R is the resistance, l is the length of the material and A is the area of cross-section.

• The slope can be written as 1/R=tan θ.

Calculation:

• The length is constant so

A/ρl=tan θ; fracAtanθ=mathrmρ

ρ_A: ρ_B: ρ_C=1/0.5:2/0.1:3/0.2; →ρ_A: ρ_B: ρ_C=10/5:20/1:30/2; →ρ_A: ρ_B: ρ_C=2:20:15

Hence the ratio of ρA : ρB : ρC = 2 : 20 : 15

Q92. Answer: (c) Lakshya Sen

The correct answer is Lakshya Sen.

Key Points

• 2022 All England Open (officially known as the Yonex All England Open Badminton Championships 2022 for sponsorship reasons) was a badminton tournament that took place at Utilita Arena Birmingham in Birmingham, England, from 16 to 20 March 2022.

• Lakshya Sen, who won bronze at the World Championships against Viktor Axelsen in the men's singles final got second place in Yonex.

• He was born in Almora, Uttarakhand.

• Sen was formerly the Junior no. 1 in the world.

• In the boys' singles event at the 2018 Asian Junior Championships and in the mixed team competition at the Summer Youth Olympics, he took home gold medals.

Additional Information

• Kidambi Srikanth:

• Srikanth Kidambi is also an Indian Badminton player born in Ravulapalem, Andhra Pradesh.

• Kidambi, a former world number one, received the Padma Shri in 2018, India's fourth-highest civilian honour and the 2015 Arjuna award.

• He was the first Indian to play in the men's singles final of a World Championship in 2021.

• Purupalli Kashyap:

• Purupalli Kashyap is an Indian Badminton player born in Hyderabad.

• Kashyap is a former world number 6.

• He has been awarded by the government of India in 2012.

• As the first male Indian player to do so, he made Olympic history by making it all the way to the men's singles quarterfinals in London in 2012.

• Chirag Sen:

• Chirag Sen is an Indian Badminton player who belongs to a Badminton family.

• He is the brother of a prominent Indian player Lakshya Sen.

• He won the 2014 Sushant Chipalkaatti Memorial India Junior International Badminton Championship by defeating Kaushal Dharmamer.

• He also won the men's doubles gold medal at the 2015 BWF Junior International with his brother Lakshya Sen.

• At the 2020 Iran International Badminton Tournament, earned a bronze medal in the men's singles division.

• He bagged the men's singles gold medal at the 2020 Kenya International Badminton Tournament by defeating Anuoluwapo Juwon Opeyori of Nigeria.

Q93. Answer: (a) Defence Research and Development Organisation (DRDO) and Indian Institute of Technology (IIT), Delhi

The correct answer is Defence Research and Development Organisation (DRDO) and Indian Institute of Technology (IIT), Delhi.

Key Points

• In February 2022, a joint team of scientists from the Defence Research and Development Organisation (DRDO) and the Indian Institute of Technology (IIT) Delhi, for the first time in the country successfully demonstrated the Quantum Key Distribution link between Prayagraj and Vindhyachal in Uttar Pradesh, a distance of more than 100 kilometres.

• Quantum Key Distribution also called Quantum Cryptography, is a mechanism to develop secure communication.

• It provides a way of distributing and sharing secret keys that are necessary for cryptographic protocols.

• Cryptography is the study of secure communications techniques that allow only the sender and intended recipient of a message to view its contents.

• Cryptographic algorithms and protocols are necessary to keep a system secure, particularly when communicating through an untrusted network such as the Internet.

• The conventional cryptosystems used for data-encryption rely on the complexity of mathematical algorithms, whereas the security offered by quantum communication is based on the laws of Physics.

Q94. Answer: (c) ZD*VY

Given:

Number\Symbol	**6**	**8**	**4**	**•**	**5**	**#**	**%**	**2**	**$**	**1**	**^**	**7**	**9**	**•**	**@**
Code	S	U	T	W	N	P	V	D	A	Z	J	M	O	M	Y

Conditions for coding the group elements,

S.no.	**Condition**	**Result**
1	If the first and the last elements are numbers.	The code for the last element will be replaced by symbol @.
2	If the first element is a symbol.	The code for first element will be coded as ©.
3	If both the first and second elements are numbers.	The code for third element is *.

1 2 ^ % @

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

Condition 2: Doesn't follow → First element is not a symbol but a number.

Condition 3: Follows → First and second elements are number. Therefore, third element is to be coded as *.

Thus, the code for 12^%@ is:-

Number/ Symbol	**1**	**2**	**^**	**%**	**@**

Code letter for Number/ Symbol	Z	D	•	V	Y

Hence, the code for "1 2 ^ % @" is "Z D * V Y".

Q95. Answer: (c) Rajasthan

The correct answer is Rajasthan.

Key Points

• Rajasthan is the largest state of India in terms of area.

• It covers an area of 342,239 sq. km and has a population of 6.85 crores as per the 2011 census.

• Uttar Pradesh is the largest state of India in terms of population.

Additional Information

• Area wise states-

S.no	States
1.	Rajasthan
2.	Madhya Pradesh
3.	Maharashtra
4.	Uttar Pradesh

• Population wise states-

S.no	States
1.	Uttar Pradesh
2.	Maharashtra
3.	Bihar
4.	West Bengal

• Area of Rajasthan is 342,239 km sq.

• Area of Madhya Pradesh is 308,252 km sq.

• Area of Maharastra is 307,713 km sq.

• Area of Uttar Pradesh is 240,928 km sq.

Q96. Answer: (b) NaCl

The correct answer is NaCl.

Key Points

• In down's Process Sodium chloride melts at a very high temperature of 801°C.

• Therefore anhydride calcium chloride is added in the mixture in the ratio of CaCl2: NaCl = 3:2 reduces the melting point to 580°C.

• Electrolysis is done with an iron cathode and graphite anode and iron gauze preventing the mixing of products chlorine and sodium.

• The products of molten sodium chloride are sodium metal and chlorine gas.

Additional Information

• The aqueous solution of Sodium sulphate (Na2SO4) produces Sodium ion (Na^+) and Sulphate ion (SO4^(2-))

• The aqueous solution of Na2O produces some amount of Sodium hydroxide.

• The aqueous solution of NaHCO3 produces Sodium and Hydrocarbon ions.

Q97. Answer: (b) Neither conclusion I nor II is true

Given:

Statement: G > A ≥ B ≥ C > D ≤ E ≤ F

Here, G is greater than A which is greater than and equal to B which is greater than and equal to C which is further greater than D which is smaller than and equal to E which is smaller than and equal to F.

Conclusions:

I. A > E → False (According to the given relation, there is no direct relation between E and A, so we can not conclude the relation

between them.)

II. B ≤ F → False (According to the given relation, there is no direct relation between B and F, so we can not conclude the relation between them.)

Hence, "Neither conclusion I nor II is true".

Q98. Answer: (a) E < A

Given:

Statements: A ≥ B, C ≤ D, B = D > E

Combine the statements: A ≥ B = D > E or A ≥ B = D ≥ C

Here, B is equal to D. And B is less than equal to A. And D is greater than E and greater than equal to C.

Conclusions:

1. E < A → True (As there is a relation between E and B due to which A and E are indirectly related to each other.)
2. D ≥ A → False (According to the relation A ≥ B = D.)
3. E > B → False. (According to the relation B = D > E.)
4. B < C → False (According to the relation B = D ≥ C.)

Hence, E < A conclusion is true.

Q99. Answer: (d) Na2CO3.10H2O

The correct answer is Na2CO3.10H2O.

Key Points

• The scientific formula for Washing Soda is Na2CO3.10H2O.
• Its full name is Sodium Carbonate decahydrate.
• Here H2O is the water molecule attached to it.

Additional Information

• It is used in removing stains.
• It is used in removing the permanent hardness of the water.
• It is used in the manufacturing of soap, paper as well as glass.
• It is also used in textiles and petroleum refining.

Q100. Answer: (d) 8x3

Shortcut Trick

Identify the expression as the standard algebraic identity: $a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$.

Let a = (x − y) and b = (x + y).

Then, (a + b) = (x − y) + (x + y) = 2x.

The simplified result is $(2x)^3 = 8x^3$.

Therefore The correct answer is $8x^3$.

Alternate Method

Given: $(x − y)^3 + (x + y)^3 + 3(x − y)(x^2 − y^2) + 3(x + y)(x^2 − y^2)$

Formula Used: $a^3 + b^3 + 3a^2b + 3ab^2 = (a + b)^3$ and $(x^2 − y^2) = (x − y)(x + y)$

=> Expression = $(x − y)^3 + (x + y)^3 + 3(x − y)[(x − y)(x + y)] + 3(x + y)[(x − y)(x + y)]$

=> Expression = $(x − y)^3 + (x + y)^3 + 3(x − y)^2(x + y) + 3(x + y)^2(x − y)$

=> Let a = (x − y) and b = (x + y)

=> Expression = $a^3 + b^3 + 3a^2b + 3ab^2$

=> Expression = $(a + b)^3$

=> Substitute the values of a and b back: $[(x − y) + (x + y)]^3$

=> $(2x)^3 = 8x^3$

Therefore The correct answer is $8x^3$.

Additional Information

Cube of a Sum Identity

The expansion of $(a + b)^3$ is $a^3 + 3a^2b + 3ab^2 + b^3$, which can also be written as $a^3 + b^3 + 3ab(a + b)$.

Cube of a Difference Identity

The expansion of $(a − b)^3$ is $a^3 − 3a^2b + 3ab^2 − b^3$, or $a^3 − b^3 − 3ab(a − b)$.

Difference of Squares

The identity $a^2 - b^2 = (a - b)(a + b)$ is frequently used to simplify terms in polynomial expansions.

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