RRB Group D Previous Year Paper (Held on: 13 Sept 2022 Shift 2)

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

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CBT

Q1. In which country were the 22^(nd) Commonwealth Games held?

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

Q2. Bhima River, which is a major tributary of the Krishna River, flows through:

(a) Rajasthan and Haryana
(b) Maharashtra and Karnataka
(c) Tamil Nadu and Karnataka
(d) Goa and Karnataka

Q3. The length of each of the two equal sides of an isosceles triangle is 5 cm each and the length of its base is 8 cm. The area (in cm^2) of the triangle is:

(a) 18
(b) 15
(c) 9
(d) 12

Q4. The simple interest on a principal amount is Rs. 192 for a period of 2 years at the rate of 8% per annum. The principal amount is:

(a) Rs. 1,600
(b) Rs. 1,000
(c) Rs. 1,400
(d) Rs. 1,200

Q5. What is the effect of bile salts in the digestion of food?

(a) They break up big fat globules into small globules.
(b) They activate lipases to begin digestion of proteins.
(c) They contains fat-digestive enzymes called lipases.
(d) They digest fat globules to release fatty acids.

Q6. Which of the following elements have similar properties with Eka-silicon, Eka-boron and Eka-aluminium, respectively?

(a) Carbon, Scandium, and Indium
(b) Germanium, Scandium, and Gallium
(c) Scandium, Gallium, and Germanium
(d) Germanium, Carbon, and Gallium

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Q7. Hindi continues to be the most widely spoken language in India at _____ of the population, and continues to grow at a rapid pace, mostly driven by higher population growth in Hindi speaking states as per census 2011.

(a) 42.03%
(b) 41.03%
(c) 44.04%
(d) 43.63%

Q8. A point on the principal axis of a concave mirror, from where a ray of light reflects back without any deviation, is:

(a) infinity
(b) principal focus
(c) centre of curvature
(d) pole

Q9. Which of the following describes the nature of the roots of the quadratic equation $4x^2 - 7\sqrt{3}x + 12 = 0$?

(a) Two equal roots
(b) One real root and one imaginary root
(c) Two distinct real roots
(d) No real roots

Q10. One-third of a journey is covered at a speed of 25 km/h, the next one-third of the journey is covered at a speed of 40 km/h and the remaining journey is covered at a speed of 50 km/h. The average speed (in km/h, rounded off to 1 decimal place) for the entire journey is:

(a) 30.3
(b) 33.3
(c) 25.3
(d) 35.3

Q11. The first Fullerene to be identified was _____.

(a) C-60
(b) C-600
(c) C-660
(d) C-160

Q12. The sum of two numbers is 9 and the sum of their squares are 41. The numbers are:

(a) 5, 4
(b) 6, 3
(c) 7, 2
(d) 1, 8

Q13. As of March 2022, how many High Courts are there in India?

(a) 23
(b) 22
(c) 25
(d) 24

Q14. Which of the following numbers will replace the question mark (?) in the given series?

105, 107, 103, ?, 101, 111

(a) 109
(b) 108
(c) 97
(d) 95

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Q15. Each of the digits in the number 8759236 is arranged in ascending order from left to right. The position of how many digits will remain unchanged as compared to that in the original number?

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

Q16. A statement is given below, followed by four conclusions given in the options. Find out which conclusion is true based on the given statement.

Statement: $X \leq F \leq U \geq A < Z > J$

(a) $F \leq U \geq A$
(b) $U \geq A \geq F$
(c) $U > Z > J$
(d) $A < Z < X$

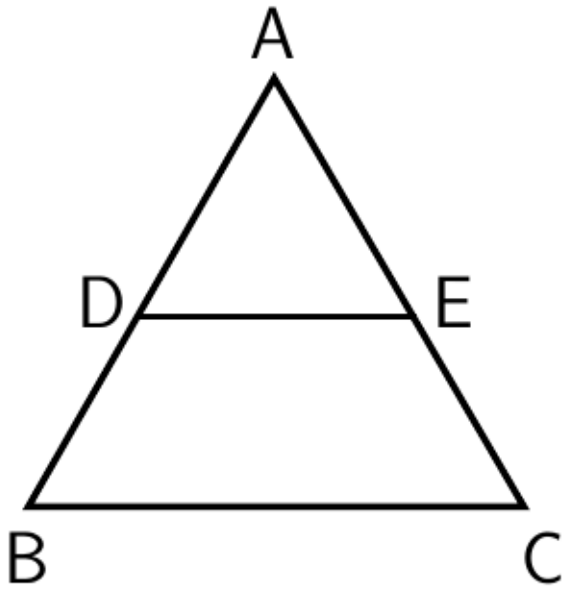
Q17. Father's age is three times the sum of ages of his two children, After 6 years, his age will be twice the sum of the ages of both the children. The age of the father is:

(a) 50 years
(b) 36 years
(c) 52 years
(d) 54 years

Q18. What is an aquifer?

(a) Pockets of freshwater trapped in sandy beds in a desert
(b) Sheets of frozen water found in rocky caves at high altitudes
(c) Water that flows through natural channels in an estuary
(d) Water stored underground between layers of hard rock

Q19. In the given figure, in Δ ABC, DE || BC, AD = 7 cm, AE = 3.5 cm and DB = 6 cm, What is the value of AC? [Note: Diagram is not drawn to scale or measurements indicated.)



(a) 4.5 cm
(b) 4 cm
(c) 3 cm
(d) 6.5 cm

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Q20. Three statements are given, followed by two conclusions numbered I and II. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

1. All jugs are cups.

2. All cups are espressos.

3. Some jugs are saucers.

Conclusions:

I. Some espressos are saucers.

II. Some cups are jugs.

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

Q21. The budget expenditure of the government is broadly classified into how many categories?

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

Q22. If the cost price of 24 pencils is equal to the selling price of 16 pencils, then the gain percentage is _____.

(a) 38%
(b) 42%
(c) 25%
(d) 50%

Q23. Which of the following is the highest layer of atmosphere?

(a) Mesosphere
(b) Stratosphere
(c) Exosphere
(d) Thermosphere

Q24. Select the triad which follows the same pattern as that followed by the two triads given below. Both triads follow the same pattern.

NE - MF -LG

LS - KT- JU

(a) AV - ZW - YX
(b) ET - FS - GR
(c) BD - ZE - YF
(d) RG - SH - TI

Q25. Which of the following festivals is mainly celebrated in Vadakkunnathan temple of Kerala?

(a) Thiruvathira
(b) Bastar Dussehra
(c) Kullu Dussehra
(d) Thrissur Pooram

Q26. Raveena travels 5 km towards South from her house. From there, she goes 7 km towards East, then 4 km towards South, then 7 km towards West and then finally 5 km towards South. How far is Raveena from her house and in which direction?

(a) 14 km, North
(b) 5 km, South
(c) 9 km, North

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(d) 14 km, South

Q27. At 6:00 a.m., a wrist watch's hour hand is showing north-west, which direction will hour hand show at 9:00 p.m.?

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

Q28. The sum of five consecutive even numbers is 2720. The sum of the third and fifth numbers is:

(a) 1292
(b) 1392
(c) 1192
(d) 1092

Q29. Petroleum is called _____.

(a) a non-renewable resource since conditions that produced it no longer exist
(b) a renewable resource since it is derived from dead plants
(c) a non-renewable resource since it cannot be made in a factory
(d) a renewable resource since a single oil well gives oil everyday

Q30. What is the value of 5^5 × (125)^(-2/3)×(25)^(-1/2) ?

(a) 1/25
(b) 25
(c) 5
(d) 1/5

Q31. A man sells a cupboard at a certain price S, get 20% of the profit on his selling price. If the price at which he buys the cupboard increases by 10% and he sells it at a. 4% higher price than S, then his profit percentage will be:

(a) 18.18%
(b) 22.7%
(c) 23.4%
(d) 21.8%

Q32. P, Q, R, S, T, U and V live on different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it, number 2 and so on till the topmost floor is numbered 7. U lives on the floor immediately above V. T lives immediately above P and immediately below R. S does not live on any floor immediately above U or above R. P lives on third floor which is immediately above Q. Who lives on the first floor?

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

Q33. A real image of equal size is obtained at a distance of 48 cm from the lens. The type of the lens and its focal length is:

(a) convex lens of focal length 48 cm
(b) concave lens of focal length of 48 cm
(c) convex lens of focal length 24 cm
(d) concave lens of focal length 24 cm

Q34. $(34)^3$ is equal to:

(a) 39204
(b) 39304
(c) 40304
(d) 29304

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Q35. Marginal cost of production refers to the change in total cost to produce _____ additional unit(s).

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

Q36. During which of the following years the first Five Year Plan was implemented?

(a) 1954-1959
(b) 1947-1952
(c) 1951-1956
(d) 1961-1966

Q37. How many children received the Pradhan Mantri Rashtriya Bal Puraskar 2022, award from PM Narendra Modi on National girl child day?

(a) 29
(b) 39
(c) 9
(d) 19

Q38. Simplify $(12^3 \times 6^2 \times 8)/(4^5 \times 3^5)$

(a) 2
(b) 4
(c) 1
(d) 8

Q39. Rigveda consists of a collection of _____.

(a) 3028 hymns
(b) 2028 hymns
(c) 4028 hymns
(d) 1028 hymns

Q40. If '+' means '×', '×' means '÷', '÷' means '-', and '-' means '+', then what will be the value of the given expression?
79 - 87 + 5 ÷ 48 × 3

(a) 656
(b) 498
(c) 512
(d) 452

Q41. Which of the following metals is able to liberate hydrogen gas from dilute hydrochloric acid?

(a) Ag
(b) Cu
(c) Hg
(d) Pb

Q42. If a person covers 10.5 km in 2 hours, then the distance covered by him at the same speed in 5 hours will be:

(a) 26.20 km
(b) 26.25 km
(c) 25.50 km
(d) 25.75 km

Q43. Who is the captain of the Indian women's cricket team for the commonwealth game 2022?

(a) Mithali Raj
(b) Shafali Verma
(c) Harmanpreet Kaur
(d) Jhula Goswami

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Q44. Refer to the following letter, number and symbol series and answer the question.

(Left) H T & Q % 9 D 6 @ 6 L & 4 P Z # 5 7 U * Y (Right)

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

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

Q45. A, B, C, D, E, F, G and H are sitting around a square table facing the centre of the table (but not necessarily in the same order). Four of them are sitting at the corners while four of them are sitting at the exact centre of the sides. A is on the immediate right of H who is sitting at the exact center of one of the sides of the table. D is an immediate neighbour of A. B is sitting on the immediate right of D. F is the immediate neighbor of B and C. E is sitting to the immediate left of G. Who is sitting to the immediate left of H?

(a) G
(b) D
(c) F
(d) E

Q46. The sum of the ages of a man and his son is 68 years. After 5 years, the age of man will be five times the age of his son. The present age of the son is

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

Q47. Which country was ranked 101^(st) in the Global Hunger Index 2021?

(a) Sri Lanka
(b) Nepal
(c) India
(d) Bangladesh

Q48. In a certain code language, ‘POWER’ is written as ‘RRAJX’ and ‘HELLO’ is written as ‘JHPQU’. How will ‘NEVER’ be written in that language?

(a) PHZXJ
(b) PHJZX
(c) PHZJZ
(d) PHZJX

Q49. Which of the following fundamental rights is mentioned in Article 32 of the Indian Constitution?

(a) Right to Freedom
(b) Right to Constitutional Remedies
(c) Right to Property
(d) Right to Equality

Q50. The first Indian Reserve Forest is _____.

(a) Jim Corbett National Park
(b) Pench National Park
(c) Satpura National Park
(d) Kaziranga National Park

Q51. Three resistors of 4 Ω, 8 Ω and 6 Ω are connected in parallel combination with a 9 V battery. The total current drawn, from the battery is:

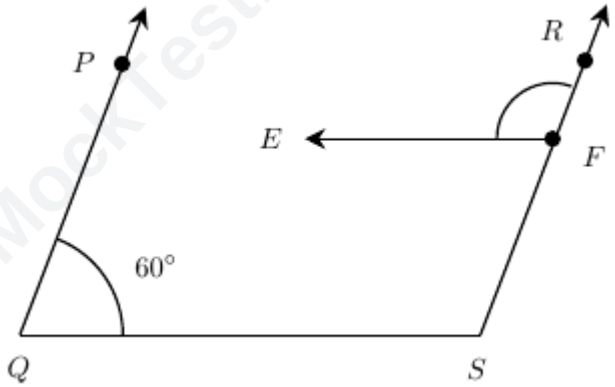
(a) 4.8 A
(b) 4.2 A

(c) 8.4 A
(d) 6.4 A

Q52. A 5 cm long pin is placed 50 cm far from a concave mirror of focal length 40 cm. Its image will be formed at _____.
(a) 2 m behind the mirror
(b) 1 m behind the mirror
(c) 2 m in front of the mirror
(d) 1 m in front of the mirror

Q53. Which of the following numbers will replace the question mark (?) in the given series?
15, 26, 48, 81, 125, ?
(a) 182
(b) 180
(c) 170
(d) 169

Q54. In the given figure, QS || EF and RS || PQ. If m angle PQS = 60°, then angle RFE = ?



(a) 120°
(b) 130°
(c) 110°
(d) 140°

Q55. In general, the oxides of non-metals are _____ in nature.
(a) neutral
(b) basic
(c) acidic
(d) amphoteric

Q56. A ray of light undergoes refraction through a triangular glass prism. The angle between the incident ray and emergent ray is called:
(a) angle of incidence
(b) angle of emergence
(c) angle of refraction
(d) angle of deviation

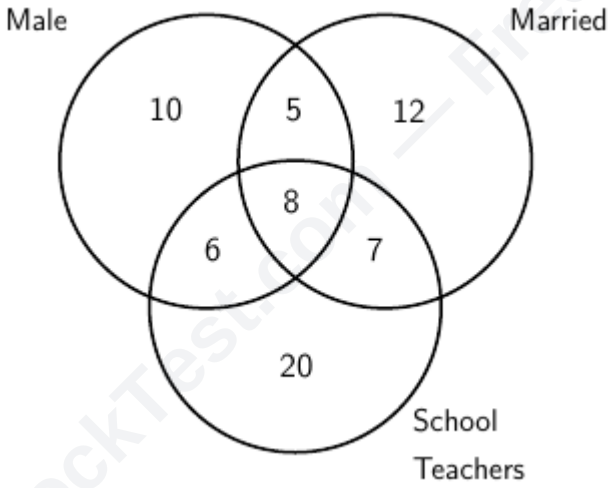
Q57. Which of the following balanced equations is correct for the given reaction?
Calcium chloride + Sulphuric acid → Calcium sulphate + Hydrogen chloride
(a) $2CaCl_2 + H_2SO_4 \rightarrow 2CaSO_4 + 2HCl$
(b) $CaCl_2 + 2H_2SO_4 \rightarrow CaSO_4 + 2HCl$
(c) $CaCl_2 + H_2SO_4 \rightarrow CaSO_4 + HCl$
(d) $CaCl_2 + H_2SO_4 \rightarrow CaSO_4 + 2HCl$

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Q58. The sides of a rectangle are in the ratio 8 : 10 and its perimeter is 90 cm. The area of this rectangle is

(a) 450 cm²
(b) 550 cm²
(c) 500 cm²
(d) 520 cm²

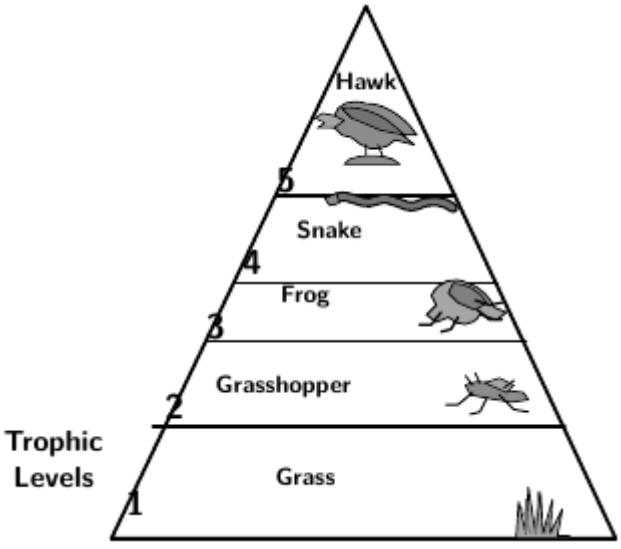
Q59. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



How many married males are school teachers?

(a) 13
(b) 8
(c) 14
(d) 15

Q60. A simple food chain of 5 trophic levels is shown below. If the snake which is present in the fourth tropic level gets 10 kJ of energy, then what amount of energy is available at the producers?

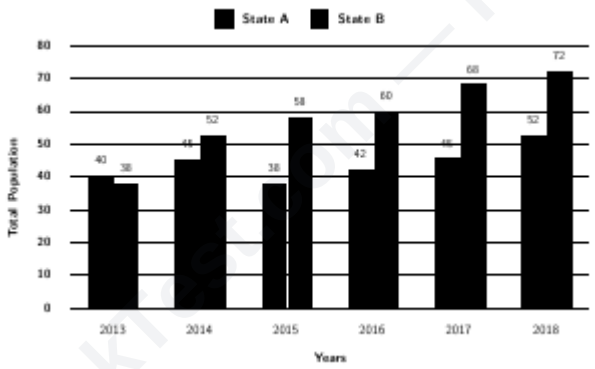


(a) 100 kJ
(b) 1,00,00,000 kJ
(c) 1,000 kJ
(d) 10,000 kJ

Q61. Six boxes, J, K, L, M, N and O, are kept one over the other, but not necessarily in the same order. J is kept immediately above N. Only one box is kept between K and O. O is the bottom-most box, and M is the top-most box. Which box is kept immediately below M?

(a) N
(b) J
(c) L
(d) K

Q62. The column graph given below shows the population of two states (in lakhs) over the years. Study the graph and answer the question.



What is the difference in the population of state A and B together in years 2013 and 2018?

(a) 22.0 lakhs
(b) 28 lakhs
(c) 27 lakhs
(d) 46 lakhs

Q63. Refer to the following letter arrangement and answer the question that follows.

A W S X Z E C D R V F T B H N M H Y J K I O L

How many letters are there in the given series between the letter that is third from the left end and second vowel from the right end of the given series?

(a) 16
(b) 17
(c) 19
(d) 15

Q64. The HCF and the LCM of two numbers are 1080 and 30240, respectively. If one of the numbers is 4320, then the other number is _____.

(a) 30240
(b) 8640
(c) 1080
(d) 7560

Q65. The magnitudes of the magnetic field at a point at distance r from a straight conductor carrying current I, 2I and 3I, one by one, are B1, B2 and B3, respectively. Which of the following relations is correct?

(a) B2 > B3 > B1
(b) B3 > B2 > B1
(c) B1 > B2 > B3
(d) B1 = B2 = B3

Q66. What will come in the place of '?' in the following equation, if '+ and ' -' are interchanged and also '×' and '÷' are interchanged?

17 - 3 ÷ 2 + 12 × 4 = ?

(a) 20

(b) 21
(c) 22
(d) 24

Q67. 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.

A_DF_AC_FB_CDF_ACD_D

(a) CDFCCA
(b) CDADFA
(c) CADACF
(d) CADFCC

Q68. The sum of the first five prime numbers is:

(a) 28
(b) 29
(c) 27
(d) 26

Q69. If 7 September 2012 is a Friday, then what will be the day of the week on 17 December 2014?

(a) Wednesday
(b) Sunday
(c) Monday
(d) Thursday

Q70. Which of the following is/are a function of money?

(A) Used as a store of value.

(B) Used as a measure of value.

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

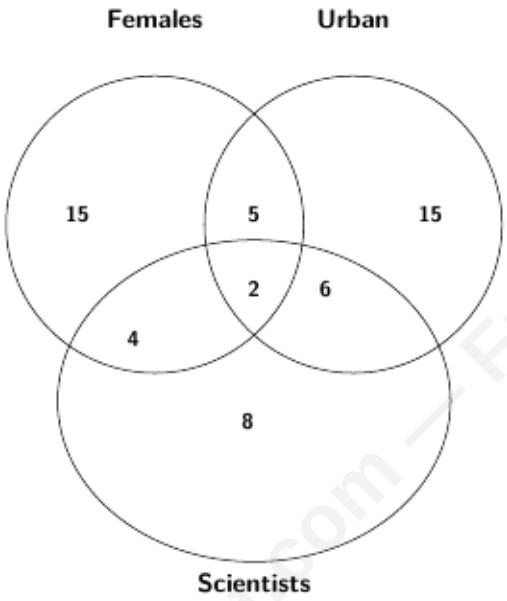
Q71. Select the conclusion that is true based on the given statement:

Statement: $F > N \geq Z \leq S = B < W$

(a) $F > S$
(b) $N > B$
(c) $W > Z$
(d) $N \geq W$

Q72. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.

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How many such Female Scientists are there who are NOT from an Urban area?

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

Q73. When resistors are connected in parallel combination, then resultant resistance will be:

(a) Less than least resistance
(b) More than largest resistance
(c) Equal to least resistance
(d) Equal to highest resistance

Q74. The ratio of the sum of two numbers and their difference is 8 : 3. The ratio of the greater number to the smaller number is:

(a) 11 : 5
(b) 12 : 7
(c) 5 : 11
(d) 7 : 12

Q75. A certain number of people are standing together, each having a different height. A is taller than D, but shorter than F. C is shorter than E and taller than B, who is taller than F. Only one person is taller than E, and only two persons are shorter than D. If no other person is part of the group, what is the total number of people in the group?

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

Q76. Given below is a statement followed by two possible conclusions I and II. Read the information carefully and select the correct option.

Statement:

In order to minimise the consumption of plastic bags, the supermarkets across a metro city X have announced that all their customers need to bring their own bags or will have to buy jute bags from the supermarket that cost Rs. 13 per bag.

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

I. The revenue of plastic bag manufacturing companies catering to city X may reduce to some extent.

II. The smaller general stores across city X will not need to ban plastic bags.

(a) Both I and II can be concluded from the given information.

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

Q77. _____ from the Indian Institute of Science, Bengaluru, received the Shanti Swarup Bhatnagar Prize for Biological Sciences for 2021.
(a) Arun Kumar Shukla
(b) Amit Singh
(c) Anish Ghosh
(d) Binoy Kumar Saikia

Q78. What are the finger like projections that increase the area of absorption of the small intestine called?
(a) Sphincters
(b) Glands
(c) Cilia
(d) Villi

Q79. Magnetic lines move from west to east direction and the conductor placed horizontally moves towards the upward direction. In such a case, the direction of induced current is towards:
(a) West
(b) south
(c) north
(d) east

Q80. If 63 chocolates are to be divided between A and B in the ratio 4 : 5, then how many chocolates will B get?
(a) 35
(b) 49
(c) 28
(d) 27

Q81. In a certain code language, ‘BRICK’ is written as ‘BCIKR’ and ‘HOTEL’ is written as 'EHLOT’. How will ‘SPORT’ be written in that language?
(a) SROTP
(b) OPRTS
(c) RSTPO
(d) OPRST

Q82. Which of the following gases is released when zinc oxide reacts with carbon?
(a) Methane
(b) Carbon dioxide
(c) Ozone
(d) Carbon monoxide

Q83. If 1.5x = 0.02y, then the value of 1/(((y+x)/(y-x))) is _____.
(a) 370/38
(b) 37/38
(c) 37/380
(d) 38/37

Q84. A train travels 20 km in 24 minutes. If its speed is increased by 5 km/h, the time taken by it to cover the same distance will be _____ minutes.
(a) 279/11
(b) 269/11
(c) 219/11
(d) 299/11

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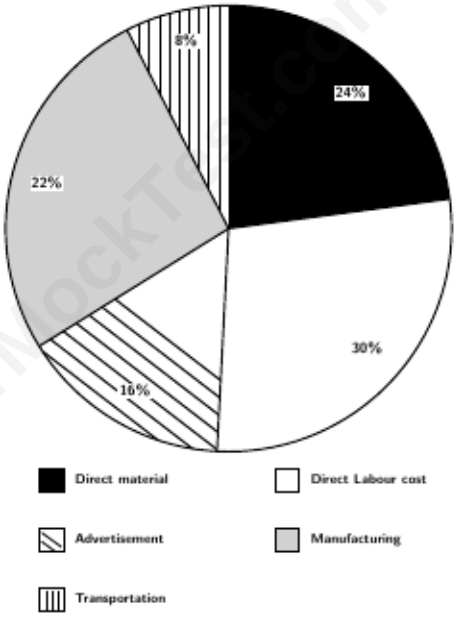
Q85. Find the value of sec 33° cosec 57°- cot 57° tan 33° + cot 47° cot 43°

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

Q86. What is the pH of salt containing a mixture of a strong base and a weak acid?

(a) pH equal to 0
(b) pH equal to 7
(c) pH less than 7
(d) pH more than 7

Q87. The following pie chart shows the percentage distribution of the expenditure incurred in manufacturing a certain product. Study the pie chart and answer the question.



If 500 products are manufactured and the direct labour cost on them amounts to Rs. 62,500, then what should be the selling price of the product so that manufacturer can earn a profit of 50%?

(a) Rs. 550
(b) Rs. 700
(c) Rs. 625
(d) Rs. 600

Q88. Which of the following methods is NOT utilised by plants to eliminate waste?

(a) Elimination of waste by falling leaves
(b) Elimination of waste by sweating
(c) Storage of waste in cell vacuoles
(d) Excretion of waste in the soil

Q89. The arithmetic mean of the observations 3, 6, 8, 10, 12, 14, 18, 24 and 31 is:

(a) 14
(b) 15
(c) 16
(d) 17

Q90. Select the option in which the numbers are related in the same way as are the numbers of the given sets.

(NOTE: Operations should be performed on the whole numbers without breaking down the numbers into its constituent digits.

E.g. 13 - Operations on 13 such as adding /deleting ‘multiplying etc. to 13 can be performed. Breaking down 13 into

1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)

(6, 7, 8)

(23, 34, 45)

(a) (8, 19, 28)
(b) (7, 12, 17)
(c) (3, 4, 9)
(d) (17, 22, 25)

Q91. In which of the following years, the 73^(rd) and 74^(th) Constitutional Amendment Acts came into force, which gave Constitutional status to Panchayati raj institutions (PRIs) and urban local bodies (ULBs) respectively?

(a) 1991
(b) 1992
(c) 1993
(d) 1994

Q92. Is there any advantage of the structure of the nephron as a long tubular structure?

(a) No, the long tubular structure has no advantage because filtration occurs at the cup-shaped end.
(b) Yes, the long tubes can be coiled and packed at high density to give firmness to the kidney.
(c) No, all nephrons are not long - some are short and others are long, but all are functional.
(d) Yes, the long tube gives time and space for re-absorption of excess water from the initial filtrate.

Q93. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(6, 30, 54)

(16, 80, 144)

(a) (21, 105, 189)
(b) (8, 35, 72)
(c) (12, 48, 108)
(d) (15, 75, 105)

Q94. Which of the following solid compounds is formed when lead nitrate is heated?

(a) Pb
(b) Pb(OH)2
(c) PbO
(d) Pb(CO3)2

Q95. How many such pairs of letters are there in the word MASTER (in the forward direction) which have as many letters between them in the word as there are in the English alphabetical order?

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

Q96. Five friends I, J, K, L and M are sitting in a row facing north. Only I is seated between L and M. K is seated 2^(nd) from the left end and is not an immediate neighbour of M. Where is J seated?

(a) At the extreme right end
(b) 2^(nd) from the right end
(c) 3^(rd) from the right end
(d) At the extreme left end

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Q97. Banas is a tributary of which of the following rivers?

(a) Chambal
(b) Gandak
(c) Rapti
(d) Tunga

Q98. The Young Bengal Movement was started by _____ who had come to Calcutta in 1826 and was appointed in the Hindu College as a teacher of English literature and History.

(a) Keshab Chandra Sen
(b) Pandit Ishwar Chandra Vidyasagar
(c) Swamy Dayanand Saraswati
(d) Henry Lui Vivian Derozio

Q99. Which of the following is an INCORRECT formula for electric power?

(a) $P = I^2R$
(b) $P = IV$
(c) $P=V/I$
(d) $P=(V^2)/R$

Q100. Which of the following schemes is formulated to mitigate gender disparity in science and engineering research funding in various Science & Technology programs in Indian academic institutions and R&D laboratories?

(a) SERB-CONTROL
(b) SERB-DRIVE
(c) SERB-ENERGY
(d) SERB-POWER

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (d) England

The correct answer is 'England'.

Key Points

• The 2022 Commonwealth Games are known as Birmingham 2022.

• An international multi-sport event for members of the Commonwealth of Nations took place in Birmingham, England from 28 July to 8 August 2022.

• Birmingham was announced as the host on 21 December 2017.

• In this, England hosted the Commonwealth Games for the third time after London in 1934 and Manchester in 2002.

• London and Manchester hosted the 7th Games in the United Kingdom after Cardiff in 1958, Edinburgh in 1970 and 1986, and Glasgow in 2014.

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Important Points

• The Indian contingent won a total of 61 medals at the 2022 Commonwealth Games in Birmingham, out of which 22 were gold, 16 silver, and 23 bronze.

• With this, India ranked fourth in this table.

• Australia topped the CWG2022 with 178 medals.

• The same was followed by England in second place and Canada in third place.

Additional Information

• The event was discontinued in 1974 after its 1962 debut.

• The country that was holding the Commonwealth Games for athletes with physical limitations hosted the games. Australia, Jamaica, Scotland, and New Zealand were the nations that held the Commonwealth Paraplegic Games in 1962, 1966, 1970, and 1974.

• The Games, which are supported by the fundamental ideals of humanity, equality, and destiny, seek to bring the Commonwealth family closer together through a spectacular festival of sport.

Q2. Answer: (b) Maharashtra and Karnataka

The correct answer is 'Maharashtra and Karnataka.

Key Points

• The Krishna River's principal tributary, the Bhima River, flows through the western Indian states of Maharashtra and Karnataka.

• It begins in the Western Ghats' Bhimashankar heights and travels 450 miles (725 km) southeast through Maharashtra before joining the Krishna in Karnataka.

• The Sina and Nira rivers are significant tributaries. The Ghataprabha, Malaprabha, Bhima, Tungabhadra, and Musi are the main tributaries that join Krishna.

• In the borders of the state of Karnataka, there is a site called Sangam where the Krishna and Bhima Rivers merge. Here, the Bhima River and Krishna merge.

• Guru Charitra (Dattatreya Charitra) claimed that this Mersing Point was called Nirvruthi.

Q3. Answer: (d) 12

Shortcut Trick

In an isosceles triangle, the altitude to the base bisects the base.

Half-base = 8 ÷ 2 = 4 cm.

Using Pythagorean triplet (3, 4, 5): Height = $\sqrt{(5^2 - 4^2)} = 3$ cm.

Area = 1/2 × Base × Height = 1/2 × 8 × 3 = 12 cm².

Therefore The correct answer is 12 cm².

Alternate Method

Given: Equal sides (a) = 5 cm, Base (b) = 8 cm.

Formula Used: Area of Isosceles Triangle = $(b/4)\sqrt{(4a^2 - b^2)}$

=> Area = $(8/4) \times \sqrt{(4 \times 5^2 - 8^2)}$

=> Area = $2 \times \sqrt{(4 \times 25 - 64)}$

=> Area = $2 \times \sqrt{(100 - 64)}$

=> Area = $2 \times \sqrt{36}$

=> Area = 2 × 6 = 12 cm²

Therefore The correct answer is 12 cm².

Additional Information

Heron's Formula

For any triangle with sides a, b, and c, Area = $\sqrt{(s(s-a)(s-b)(s-c))}$, where semi-perimeter s = (a+b+c)/2.

Pythagorean Triplets

Common integer sets for right triangles include (3, 4, 5), (5, 12, 13), (8, 15, 17), and (7, 24, 25).

Isosceles Triangle Property

The altitude drawn from the vertex connecting equal sides to the base bisects the base and the vertex angle.

Q4. Answer: (d) Rs. 1,200

Shortcut Trick

Effective Rate of Interest for 2 years = 8% × 2 = 16%

According to the question, 16% of Principal = Rs. 192

1% of Principal = 192 ÷ 16 = Rs. 12
100% of Principal = 12 × 100 = Rs. 1,200
Therefore The correct answer is Rs. 1,200.
Alternate Method
Given:
Simple Interest (SI) = Rs. 192
Time (T) = 2 years
Rate (R) = 8% per annum
Formula Used:
Simple Interest = (Principal × Rate × Time) ÷ 100
Calculations:
=> 192 = (Principal × 8 × 2) ÷ 100
=> 192 = (Principal × 16) ÷ 100
=> Principal = (192 × 100) ÷ 16
=> Principal = 12 × 100
=> Principal = Rs. 1,200
Therefore The correct answer is Rs. 1,200.
Additional Information
Compound Interest Formula
When interest is compounded annually, the Amount (A) is calculated as $A = P(1 + r/100)^n$, where n is the number of years.
Difference between SI and CI
The difference between Compound Interest and Simple Interest for a period of 2 years is given by the formula: Difference = $P(r/100)^2$.
Amount in Simple Interest
Total Amount to be paid after the time period is the sum of Principal and Simple Interest: A = P + SI.

Q5. Answer: (a) They break up big fat globules into small globules.

The correct answer is "They break up big fat globules into small globules."
Key Points
• Bile helps in breaking down the big fat globules into small fat globules.
• The smaller fat globules provide larger area for lipase to act and make the process of digestion faster.
• It helps in converting fats present in food to fatty acids.
• They play a very important role in the digestion and absorption of food.
• Bile is crucial for the controlled release and transportation of medications and nutrients that are lipid soluble.
• Also, they facilitate the body's absorption of fat-soluble vitamins such as vitamin A, D, E, and K.
Additional Information
• Bile juice is a digestive fluid produced by the liver.
• It is stored and converted in the gall bladder.
• The gallbladder is where our liver stores bile, a greenish-yellow fluid.
• Cholesterol, water, bile acids, and the pigment bilirubin are all components of bile in addition to bile salts.

Q6. Answer: (b) Germanium, Scandium, and Gallium

The correct answer is Germanium, Scandium, and Gallium.
Key Points
• These names were given by Mendeleev.
• Eka-silicon was the name given to an undiscovered element named germanium.
• Eka-boron was the name given to an undiscovered element and named it scandium.
• Eka-aluminium was the name given to an undiscovered element and named it gallium.
Additional Information
• It was named Eka-silicon because it lies below silicon.
• It was named Eka-boron because it lies below boron.
• It was named Eka-aluminium because it lies below gallium.

Q7. Answer: (d) 43.63%

The correct answer is '43.63%'.

Key Points

• Over the years, Hindi has been the mother tongue of choice in India, with its share of the population growing with each census.

• The percentage of Indians who claimed Hindi as their mother tongue in 1971 increased during the following four censuses, reaching 38.7%, 39.2%, 41%, and 43.6% as of the most recent count.

• Hindi is the most widely used language for communication between people in the south and north of India, hence the majority of people in India are native Hindi speakers.

• English is no longer regarded as foreign.

• Hence, depending on the number of speakers, you now know which languages are most widely spoken in India.

Q8. Answer: (c) centre of curvature

The correct answer is center of curvature.

Key Points

• The centre of the sphere formed by the reflecting part of a spherical mirror is called centre of curvature.

• A ray passing through the centre of curvature of a concave mirror, after reflection, is reflected along the same path.

• The light rays come back along the same path because the incident rays fall on the mirror along the normal to the reflecting surface.

• Additional Information

• The incident rays coming parallel to the principal axis after reflection appear to converge to a common point on the principal axis, this point is called the principal focus of a concave mirror.

• The image formed at infinity is highly diminished, point size, real and inverted.

Q9. Answer: (d) No real roots

Shortcut Trick

To find the nature of the roots, check the Discriminant (D) = $b^2 - 4ac$.

$D = (-7\sqrt{3})^2 - 4(4)(12)$

$D = 147 - 192 = -45$

Since $D < 0$, the equation has no real roots.

Therefore The correct answer is No real roots.

Alternate Method

Given: The quadratic equation is $4x^2 - 7\sqrt{3}x + 12 = 0$.

Formula Used:

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

$D = b^2 - 4ac$

Calculations:

=> Comparing with the standard form, $a = 4$, $b = -7\sqrt{3}$, and $c = 12$.

=> $D = (-7\sqrt{3})^2 - 4 \times 4 \times 12$

=> $D = (49 \times 3) - (16 \times 12)$

=> $D = 147 - 192$

=> $D = -45$

=> Since $D < 0$, the roots of the given equation are imaginary or non-real.

Therefore The correct answer is No real roots.

Additional Information

Discriminant and Nature of Roots

If $D > 0$, the roots are real and distinct. If $D = 0$, the roots are real and equal. If $D < 0$, there are no real roots.

Sum and Product of Roots

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

Quadratic Formula

Roots are calculated using $x = (-b \pm \sqrt{D}) / 2a$, where D is the discriminant.

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Q10. Answer: (d) 35.3

Shortcut Trick

When three equal distances are covered at speeds x, y, and z, the Average Speed = 3xyz ÷ (xy + yz + zx).

Average Speed = (3 × 25 × 40 × 50) ÷ (25×40 + 40×50 + 50×25)

Average Speed = 150000 ÷ (1000 + 2000 + 1250) = 150000 ÷ 4250

Average Speed = 15000 ÷ 425 ≈ 35.3 km/h.

Therefore The correct answer is 35.3 km/h.

Alternate Method

Given: Speeds for three equal parts of the journey are 25 km/h, 40 km/h, and 50 km/h.

Formula Used: Average Speed = Total Distance ÷ Total Time

=> Let the Total Distance be the LCM of 25, 40, and 50 × 3 = 200 × 3 = 600 km.

=> Each one-third part = 200 km.

=> Time1 = 200 ÷ 25 = 8 hours.

=> Time2 = 200 ÷ 40 = 5 hours.

=> Time3 = 200 ÷ 50 = 4 hours.

=> Total Time = 8 + 5 + 4 = 17 hours.

=> Average Speed = 600 ÷ 17 = 35.294... km/h.

=> Average Speed ≈ 35.3 km/h.

Therefore The correct answer is 35.3 km/h.

Additional Information

Average Speed (Equal Distances)

For two equal distances covered at speeds v1 and v2, Average Speed = 2v1v2 ÷ (v1 + v2). This is the Harmonic Mean of the speeds.

Average Speed (Equal Time)

If a person travels at different speeds for equal time intervals, Average Speed = (v1 + v2 + ... + v_n) ÷ n. This is the Arithmetic Mean.

General Formula

For any journey, Average Speed = (Total Distance) ÷ (Total Time taken). Always ensure units are consistent (km/h or m/s).

Q11. Answer: (a) C-60

The correct answer is C-60.

Key Points

• C-60 is named as Buckminsterfullerene.

• It was discovered in early September 1985.

• The fullerene was first discovered in 1985 by Sir Harold W. Kroto, Smalley, and Robert F. Curl.

• They discovered a cage-like molecule composed of 60 carbon atoms.

• They are a series of hollow carbon molecules that form a closed cage or a cylinder.

Additional Information

• Buckminsterfullerene is an allotrope of carbon and has 60 carbon atoms joined together.

• C-60 consists of five and six-membered carbon rings fused to each other.

• The shape of the C-60 resembles a soccer ball.

Q12. Answer: (a) 5, 4

Shortcut Trick

Directly verify the options to satisfy the given conditions: sum = 9 and sum of squares = 41.

Option 1: 5 + 4 = 9 and $5^2 + 4^2 = 25 + 16 = 41$. (Correct)

Option 2: 6 + 3 = 9 and $6^2 + 3^2 = 36 + 9 = 45$.

Option 3: 7 + 2 = 9 and $7^2 + 2^2 = 49 + 4 = 53$.

Option 4: 1 + 8 = 9 and $1^2 + 8^2 = 1 + 64 = 65$.

Therefore The correct answer is 5, 4.

Alternate Method

Given:

Let the numbers be x and y.

Sum of numbers: x + y = 9

Sum of their squares: $x^2 + y^2 = 41$

Formula Used:

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

Calculations:

$\Rightarrow (9)^2 = 41 + 2xy$

$\Rightarrow 81 = 41 + 2xy$

$\Rightarrow 2xy = 81 - 41$

$\Rightarrow 2xy = 40$

$\Rightarrow xy = 20$

Now, find two numbers whose sum is 9 and product is 20:

$\Rightarrow x^2 - (\text{Sum})x + (\text{Product}) = 0$

$\Rightarrow x^2 - 9x + 20 = 0$

$\Rightarrow x^2 - 5x - 4x + 20 = 0$

$\Rightarrow x(x - 5) - 4(x - 5) = 0$

$\Rightarrow (x - 5)(x - 4) = 0$

$\Rightarrow x = 5$ or $x = 4$

Therefore The correct answer is 5, 4.

Additional Information

Algebraic Identity for Product

The product of two numbers can be found if their sum and sum of squares are known using: $xy = [(x + y)^2 - (x^2 + y^2)] \div 2$.

Difference of Two Numbers

The difference $(x - y)$ can be calculated using the identity: $(x - y)^2 = (x + y)^2 - 4xy$ or $(x - y)^2 = 2(x^2 + y^2) - (x + y)^2$.

Quadratic Equation Roots

If sum (S) and product (P) are known, the numbers are the roots of $t^2 - St + P = 0$.

Q13. Answer: (c) 25

The correct answer is '25'.

Key Points

• The institution of the high court originated in India in 1862 with three high courts set up at Calcutta, Bombay and Madras.

• The fourth HC was established in Allahabad in 1866.

• Currently, India has a total of 25 High Courts established in different states of the country.

• Andhra Pradesh HC became the 25th HC in India commencing from 1 Jan 2010 at Amaravati.

• The UTs of Jammu and Kashmir and Ladakh have a common high court.

• Articles 214 to 231 in Part VI of the Constitution deal with the organisation, independence, jurisdiction, powers, procedures and so on of the HC.

• The Seventh Amendment Act of 1956 authorised the Parliament to establish a common HC for two or more states or two or more states and a UT

Additional Information

• Jurisdiction of High Courts

• Bombay HC - Maharashtra, Goa, Dadra and Nagar Haveli, Daman and Diu

• Guwahati HC - Assam, Nagaland, Mizoram and Arunachal Pradesh

• Punjab and Haryana HC - Punjab, Haryana, Chandigarh

• Calcutta HC - West Bengal, Andaman and Nicobar Islands

Q14. Answer: (a) 109

The logic followed here is:

So, the missing term is '109'.

Hence, the correct answer is '109'.

Q15. Answer: (c) One

The logic followed here is:

Here, the number 5 is in the third position in both the original number and new arrangement.

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So, the position of only one digit (5) remain unchanged after the rearrangement of the digits in the number.

Hence, the correct answer is 'One'.

Q16. Answer: (a) F ≤ U ≥ A

Given Statement: X ≤ F ≤ U ≥ A < Z >J

According to the given information:

• X is less than or equal to F

• F is less than or equal to U

• U is greater than or equal to A

• A is less than Z, and

• Z is greater than J

Conclusions:

• F ≤ U ≥ A → True (F ≤ U ≥ A; There is a definite relation established between F and U, and U and A, but there is no definite relation between F and A, X ≤ F ≤ U ≥ A < Z >J).

• U ≥ A ≥ F → False (F ≤ U and U ≥ A; A definite relation cannot be determined between A and F as per the given statement X ≤ F ≤ U ≥ A < Z >J)

• U > Z > J → False (U ≥ A < Z and Z >J; A definite relation can be established between Z and J but there is no definite relation between U and Z)

• A < Z < X → False (X ≤ F ≤ U ≥ A < Z; A definite relation can be established between A and Z but no such relation can be established between Z and X)

Hence, the correct answer is 'F ≤ U ≥ A'.

Q17. Answer: (d) 54 years

Shortcut Trick

Let the sum of ages of two children be S.

Present: Father = 3S

After 6 years: (3S + 6) = 2(S + 12) => 3S + 6 = 2S + 24 => S = 18.

Father’s Present Age = 3 × 18 = 54 years.

Therefore The correct answer is 54 years.

Alternate Method

Given: Father’s age is 3 times the sum of ages of two children. After 6 years, it becomes 2 times.

Let the present sum of children’s ages be x.

Let the present age of the father be y.

=> y = 3x --- (Equation 1)

After 6 years:

=> Father’s age = y + 6

=> Sum of children’s ages = x + 6 + 6 = x + 12

According to the condition:

=> y + 6 = 2(x + 12)

=> 3x + 6 = 2x + 24 (Substituting y = 3x)

=> 3x − 2x = 24 − 6

=> x = 18

=> Father’s age = 3 × 18 = 54 years.

Therefore The correct answer is 54 years.

Additional Information

Sum of Ages for Multiple Persons

If there are ‘n’ persons, after ‘t’ years, the total sum of their ages increases by (n × t).

Age Ratio Problems

When solving age problems, the difference between the ages of two individuals always remains constant regardless of the time elapsed.

Present Age calculation

Always define variables based on present ages to simplify the conversion between past and future conditions.

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Q18. Answer: (d) Water stored underground between layers of hard rock

The correct answer is Water stored underground between layers of hard rock.

Key Points

• An aquifer is the rock layer that contains water and releases it in appreciable amounts.

• This rock contains water-filled pore spaces, It is observed that when the spaces are connected, the water can flow through the matrix of the rock. An aquifer is also called a water-bearing stratum.

• Rocks like granite and schist are poor aquifers as they have very low porosity.

• When rocks are highly fractured, they make good aquifers.

Additional Information

• At the time when a water-bearing rock readily transmits water to wells and springs then it is called an aquifer. Wells can drill into the aquifers and water can be pumped out.

• Precipitation help to add water (recharge) into the porous rock of the aquifer.

Q19. Answer: (d) 6.5 cm

Shortcut Trick

In Δ ABC, since DE || BC, the side AD corresponds to AB and AE corresponds to AC.

The ratio of segments is AD : AE = 7 : 3.5 = 2 : 1.

Therefore, the ratio of the full sides AB : AC must also be 2 : 1.

Length of AB = AD + DB = 7 + 6 = 13 cm.

Therefore AC = AB ÷ 2 = 13 ÷ 2 = 6.5 cm.

Therefore The correct answer is 6.5 cm.

Alternate Method

Given:

Length of AD = 7 cm

Length of DB = 6 cm

Length of AE = 3.5 cm

Line DE || BC

Formula Used:

According to the Basic Proportionality Theorem (Thales' Theorem), if a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, the other two sides are divided in the same ratio.

AD / AB = AE / AC

Calculations:

=> First, calculate the total length of side AB:

=> AB = AD + DB

=> AB = 7 + 6 = 13 cm

=> Now, applying the property of similar triangles (Δ ADE ~ Δ ABC):

=> AD / AB = AE / AC

=> 7 / 13 = 3.5 / AC

=> AC × 7 = 13 × 3.5

=> AC = (13 × 3.5) ÷ 7

=> AC = 13 × 0.5

=> AC = 6.5 cm

Therefore The correct answer is 6.5 cm.

Additional Information

Basic Proportionality Theorem (Thales' Theorem)

If a line is parallel to one side of a triangle, it divides the other two sides in the same ratio: AD/DB = AE/EC.

AA Similarity Criterion

When DE || BC, angle ADE = angle ABC and angle AED = angle ACB (corresponding angles), making ΔADE similar to ΔABC.

Ratio of Sides in Similar Triangles

For similar triangles, the ratio of any two corresponding sides is constant: AD/AB = AE/AC = DE/BC.

Q20. Answer: (c) Both conclusions I and II follow

Statements:

1. All jugs are cups.

2. All cups are espressos.

3. Some jugs are saucers.

The least possible diagram for the given statements is as follows:

Conclusions:

I. Some espressos are saucers → Follows (Because all jugs are cups, all cups are espressos and some jugs are saucers, so some espressos will be saucers is definite).

II. Some cups are jugs → Follows (Since all jugs are cups, some jugs being cups is obvious and definite).

Hence, the correct answer is "Both conclusions I and II follow".

Q21. Answer: (c) 2

The correct answer is 2.

Key Points

• The expenditure Budget is classified into two broad categories.

• They are capital expenditure and revenue expenditure.

• Capital expenditure is the amount spent on creating assets. It is a cause for a reduction in the government's liabilities.

Additional Information

• The Essential Budget Categories

• Housing (25-35 percent)

• Transportation (10-15 percent)

• Food (10-15 percent)

• Utilities (5-10 percent)

• Insurance (10-25 percent)

• Medical & Healthcare (5-10 percent)

• Saving, Investing, & Debt Payments (10-20 percent)

• Personal Spending (5-10 percent)

Q22. Answer: (d) 50%

Shortcut Trick

If CP of x items = SP of y items, then Gain% = (x − y) ÷ y × 100.

Here, x = 24 and y = 16.

Gain% = (24 − 16) ÷ 16 × 100 = 8 ÷ 16 × 100.

Gain% = 1/2 × 100 = 50%.

Therefore The correct answer is 50%.

Alternate Method

Given: CP of 24 pencils = SP of 16 pencils.

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

=> Let the CP of 1 pencil be Re. 1.

=> Then CP of 24 pencils = Rs. 24 and CP of 16 pencils = Rs. 16.

=> According to the question, SP of 16 pencils = CP of 24 pencils = Rs. 24.

=> Now, for 16 pencils: CP = Rs. 16 and SP = Rs. 24.

=> Profit = SP − CP = 24 − 16 = Rs. 8.

=> Profit% = (8 ÷ 16) × 100 = 50%.

Therefore The correct answer is 50%.

Additional Information

Ratio Method

Express the relation as 24 × CP = 16 × SP. This gives SP/CP = 24/16 = 3/2. If CP is 2 units and SP is 3 units, profit is 1 unit.

Loss Scenario

If CP of 16 pencils = SP of 24 pencils, then Loss% = (24 − 16) ÷ 24 × 100 = 33.33%.

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Q23. Answer: (c) Exosphere

The correct answer is Exosphere.

Key Points

• An atmosphere is a layer of gas or layers of gases that envelop a planet and is held in place by the gravity of the planetary body.

• A planet contains an atmosphere considering the condition that the gravity is great and the temperature of the atmosphere is low.

• It is observed that the Earth's atmosphere has five major and several secondary layers. From lowest to highest, the layers are the Troposphere, Stratosphere, Mesosphere, Thermosphere and Exosphere.

• The exosphere starts to expand from 700 to 10,000 km (440 to 6,200 miles).

Additional Information

• The atmosphere is divided into five layers starting from the earth's surface:

1. Troposphere (0 - 18 km): This is the most important layer of the atmosphere. The air breath exists here. All the weather changes like rainfall, fog, and hailstorm occur in this layer.

2. Stratosphere (18 - 50 km): It is free from clouds which makes it the most ideal layer for flying Aeroplanes. It contains a layer of ozone gas which protects from the harmful effect of the sun's rays.

3. Mesosphere (50 - 85 km): It is the third layer of the atmosphere. The temperature drops to about -95°C. The mesosphere is the coldest region of Earth’s atmosphere.

4. Thermosphere (85 - 500 km): In this layer, the temperature rises very rapidly with increasing height. The ionosphere is a part of this layer. It helps in radio transmission.

5. Exosphere (500 - 1600 km): The uppermost layer of the atmosphere is called the exosphere. It is very thin air. Temperature is very high due to direct solar radiation. Light gases like Helium and Hydrogen float into space from here.

Q24. Answer: (a) AV - ZW - YX

The logic used here is that -1 and +1 has been done in the first letter and second letter respectively to get the next cluster.

The pattern followed here is:

• NE - MF -LG

• LS - KT- JU

From the given options, the correct answer is as follows:

Hence, the correct answer is ' AV - ZW - YX '.

Q25. Answer: (d) Thrissur Pooram

The correct answer is Thrissur Pooram.

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

• The 'Thiruvathira' festival is celebrated to commemorate the plea of Goddess Parvathi who used to regularly observe fast on Thiruvathira day in the name of Lord Shiva.

• Bastar Dussehra is a unique cultural trait of Chhattisgarh. Celebrated by the local people of the state with sufficient vigor, the festival of Dussehra connotes the supreme power of the goddess Danteswari.

• Kullu Dussehra is the renowned International Mega Dussehra festival observed in the month of October in the Himachal Pradesh state in northern India.

Q26. Answer: (d) 14 km, South

Drawing the diagram according to the given information:

1) Raveena travels 5 km towards South from her house.

2) From there, she goes 7 km towards East.

3) Then, 4 km towards South.

4) Then, 7 km towards West.

5) Then finally, 5 km towards South.

So, Raveena is now at a point 14 km south from her house.

Hence, the correct answer is '14 km, South'.

Q27. Answer: (d) North-East

When the wrist watch's hour hand is showing north-west direction at 6:00 a.m., we can represent it as follows:

So, when the wristwatch shows 9:00 p.m., we get:

The hour hand is in the North-East direction when the wristwatch shows 9:00 p.m.

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

Q28. Answer: (d) 1092

Shortcut Trick

Average of 5 consecutive even numbers = 2720 ÷ 5 = 544.

For an odd number of terms in a consecutive series, the average is always the middle (3rd) number.

=> 3rd number = 544

=> 5th number = 3rd number + 4 = 544 + 4 = 548

=> Sum of 3rd and 5th = 544 + 548 = 1092

Therefore The correct answer is 1092.

Alternate Method

Given: Sum of 5 consecutive even numbers is 2720.

Formula: Let the five numbers be x, x+2, x+4, x+6, and x+8.

=> Sum = x + (x + 2) + (x + 4) + (x + 6) + (x + 8) = 2720

=> 5x + 20 = 2720

=> 5x = 2720 − 20

=> 5x = 2700

=> x = 2700 ÷ 5 = 540

=> 3rd number = x + 4 = 540 + 4 = 544

=> 5th number = x + 8 = 540 + 8 = 548

=> Required Sum = 544 + 548 = 1092

Therefore The correct answer is 1092.

Additional Information

Arithmetic Progression Properties

Consecutive even numbers form an A.P. with a common difference (d) of 2. For an A.P. with n terms, Average = (First Term + Last Term) ÷ 2.

Sum of AP Formula

The sum of n terms of an A.P. is $S_n = (n \div 2) \times [2a + (n - 1)d]$, where a is the first term.

Middle Term Shortcut

If n is odd, the middle term of the A.P. is exactly the Arithmetic Mean (Total Sum ÷ n).

Q29. Answer: (a) a non-renewable resource since conditions that produced it no longer exist

The correct answer is a non-renewable resource since the conditions that produced it no longer exist.

Key Points

• Petroleum is called is a non-renewable resource since the conditions that produced it no longer exist.

• Nonrenewable resources are derived from the Earth— in a finite supply that can take billions of years to replenish.

• Historically, many nonrenewables have been relatively cheap to extract.

• But as their supply continues to diminish, the cost of this extraction may rise in price, leading customers to use alternative sources, such as solar and wind energy.

Q30. Answer: (b) 25

Given:

5^5× (125)^(-2/3)×(25)^(-1/2)

Concept and Formula used:

Exponential identities used are:

1. (a^x)^b=(a)^(x× b)

2. a^x× a^y=(a)^(x+y)

Calculation:

Let us simplify the equation,

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5^5× (125)^(-2/3)×(25)^(-1/2); =5^5×(5³)^(-2/3)×(5²)^(-1/2); =5^5×(5)^3×-2/3×(5)^2×-1/2; =5^5×5^(-2)×5^(-1); =(5)^(5-2-1); =5²; =25

Therefore, the value of 5^5× (125)^(-2/3)×(25)^(-1/2) is 25.

Q31. Answer: (a) 18.18%

Shortcut Trick

Let the initial Selling Price (SP) = 100.

Profit is 20% on SP => Profit = 20 => Initial Cost Price (CP) = 100 − 20 = 80.

New CP increases by 10% => New CP = 80 + 8 = 88.

New SP increases by 4% => New SP = 100 + 4 = 104.

New Profit = 104 − 88 = 16 => Profit % = (16 ÷ 88) × 100 = 18.18%.

Therefore The correct answer is 18.18%.

Alternate Method

Given:

Initial Selling Price (SP) = S

Initial Profit = 20% of the Selling Price

New Cost Price (CP) is 10% more than the initial CP.

New Selling Price (SP) is 4% more than the initial SP.

Formula Used:

Cost Price = Selling Price − Profit

Profit % = (Profit ÷ Cost Price) × 100

Initial Scenario (Let SP = 100)

CP = 80

Profit = 20

SP = 100

New Scenario

New CP = 88

P = 16

New SP = 104

+10% CP

+4% SP

Calculations:

=> Initial Profit = 20% of S = 0.2S

=> Initial CP = S − 0.2S = 0.8S

=> New CP = 0.8S + (10% of 0.8S) = 0.8S + 0.08S = 0.88S

=> New SP = S + (4% of S) = 1.04S

=> New Profit = New SP − New CP

=> New Profit = 1.04S − 0.88S = 0.16S

=> New Profit % = (New Profit ÷ New CP) × 100

=> New Profit % = (0.16S ÷ 0.88S) × 100

=> New Profit % = (16 ÷ 88) × 100

=> New Profit % = (2 ÷ 11) × 100 ≈ 18.18%

Therefore The correct answer is 18.18%.

Additional Information

Standard Base for Profit

By default, Profit and Loss percentages are always calculated on the Cost Price (CP) unless specifically stated to be calculated on the Selling Price (SP).

Profit on SP vs Profit on CP

If the profit is given as R% on Selling Price, the actual profit percentage on Cost Price is evaluated as: [R ÷ (100 − R)] × 100%. E.g., a 20% profit on SP equals a 25% profit on CP.

Marked Price & Discount

Discount is always offered on the Marked Price (MP). The selling price equation follows: SP = MP − Discount.

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Q32. Answer: (b) S

Persons: P, Q, R, S, T, U and V

Floors: 1 (Lowermost) to 7 (Topmost)

1) P lives on third floor which is immediately above Q.

Floors	Persons
7	
6	
5	
4	
3	P
2	Q
1	

2) T lives immediately above P and immediately below R.

Floors	Persons
7	
6	
5	R
4	T
3	P
2	Q
1	

3) U lives on the floor immediately above V & S does not live on any floor immediately above U or above R.

Floors	Persons
7	U
6	V
5	R
4	T
3	P
2	Q
1	S

So, S lives on the first flour.

Hence, the correct answer is 'S'.

Q33. Answer: (c) convex lens of focal length 24 cm

The correct answer is Convex lens of focal length 24 cm.

Key Points

• Convex mirrors, divergent lenses, and plane mirrors can never provide a true image.

• A true image can only be created with a concave mirror and a converging lens if the item is farther distant from the focus point (i.e., more than one focal length away).

• As the image is an equal size to that of the object. So, the object must be at 2F and also the image.

• So, the focal length of the lens must be 24 cm.

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Q34. Answer: (b) 39304

Shortcut Trick

Identify the unit digit: 43 = 64, so the answer must end in 4.

Estimate the range: 303 = 27000 and 403 = 64000.

Since 34 is closer to 30, the result should be closer to 27000 than 64000.

Calculation: 343 = 34 × 34 × 34 = 1156 × 34 = 39304.

Therefore The correct answer is 39304.

Alternate Method

Given: Number = 34

Formula Used: (a + b)3 = a3 + 3a2b + 3ab2 + b3

Take a = 30 and b = 4:

=> 343 = (30 + 4)3

=> 343 = 303 + 3 × 302 × 4 + 3 × 30 × 42 + 43

=> 343 = 27000 + (3 × 900 × 4) + (3 × 30 × 16) + 64

=> 343 = 27000 + 10800 + 1440 + 64

=> 343 = 39304

Therefore The correct answer is 39304.

Additional Information

Cube of a Number

A cube is the result of multiplying a number by itself twice (n × n × n).

Unit Digit Property

If a number ends in 4, its cube will always end in 4 because 4 × 4 × 4 = 64.

Perfect Cube Estimation

To find a cube quickly, use nearest tens to estimate the range (e.g., 303 < 343 < 403).

Q35. Answer: (d) 1

The correct answer '1'.

Key Points

• Marginal cost is defined as the cost to produce one additional unit of production.

• It is an important topic in cost accounting because marginal cost helps us to determine the most efficient level of production for the manufacturing process. It can be calculated as the number of expenses incurred if only one additional unit is manufactured.

• In economics, the marginal cost is defined as the change in total production cost when it serves from making or producing one additional unit.

• To calculate marginal cost, We have to divide the change in production costs by the change in quantity.

Q36. Answer: (c) 1951-1956

The correct answer is 1951-1956.

Key Points

• The launching time of the First Five-year Plan was in 1951.

• It is mainly focused on the development of the primary sector.

• This plan was based on the model naming Harrod–Domar adding with few modifications

• The plan was implemented by Jawaharlal Nehru, Who was India's first Prime Minister.

• The objective of this plan was to uplift the economic condition of India focusing on the parameter of improving the standard of the primary sector.

• In India agriculture, as it has been the most powerful source of the country's income.

Q37. Answer: (a) 29

The correct answer is 29.

Key Points

• Twenty-Nine Children have been selected for the Pradhan Mantri Rashtriya Bal Puraskar.

• In the current year, The candidates are selected from all regions of the country for their exceptional achievements in the field of Innovation (7), Social Service (4), Scholastic (1), Sports (8), Art & Culture (6) and Bravery (3) categories.

• These Awards are given as an appreciation to individuals who have shown an outstanding contribution towards service for children in the field of Child Development, Child Protection, and Child Welfare for more than 7 years and have created a positive

impact on the lives of children.

Additional Information

• National Girl Child Day

• It is celebrated on 24 January to spread awareness about the obstacles faced by girls in Indian society.

• It is also celebrated for promoting awareness about the rights of the girl child and the importance of female education, health, and nutrition.

• The theme for National Girl Child Day 2023 is Digital Generation, Our Generation.

Q38. Answer: (a) 2

Given: $(12^3 \times 6^2 \times 8)/(4^5 \times 3^5)$

Formula and Concept used:

Exponential properties:

$(a^m)/(a^n)=a^{(m-n)}$, $a^m \times a^n=a^{(m+n)}$ and $a^0=1$.

Calculation:

Let us simplify,

$(12^3 \times 6^2 \times 8)/(4^5 \times 3^5)$; $=((4 \times 3)^3 \times (3 \times 2)^2 \times 8)/(4^5 \times 3^5)$; $=(4^3 \times 3^3 \times 3^2 \times 2^2 \times (4 \times 2))/(4^5 \times 3^5)$; $=(4^4 \times 3^5 \times 4 \times 2)/(4^5 \times 3^5)$; $=(4^5 \times 3^5 \times 2)/(4^5 \times 3^5)$; $=(4^{(5-5)}) \times (3^{(5-5)}) \times 2$; $=4^0 \times 3^0 \times 2$; $=2$

Thus, the value obtained after simplification is 2.

Q39. Answer: (d) 1028 hymns

The correct answer is 1028 hymns.

Key Points

• In Rigveda, there are 1028 hymns, which are organized into ten books.

• These books are known as mandalas.

• Each and every mandala consist of sūktas (hymns).

• This suktas are formed by individual strophes.

• According to history, It can be said that Vyasa is the compiler of the Vedas.

• Who arranged the four kinds of mantras into four Samhitas.

Additional Information

• Samaveda:

• This consists of 1549 verses.

• It is the storehouse of the melodious chants.

• Yajurved:

• The meaning of this ved is 'Worship Knowledge'.

• It has two parts -Krishna and Sukla.

Q40. Answer: (b) 498

Symbols	•	×	÷	•
Code	×	÷	•	•

79 - 87 + 5 ÷ 48 × 3 =?

After converting the symbols with the given code, the equation will be:

→ 79 + 87 × 5 - 48 ÷ 3

→ 79 + 435 - 16

→ 498

Hence, the correct answer is '498'.

Q41. Answer: (d) Pb

Key Points

• Lead (Pb) - Lead is above hydrogen in the reactivity series. It means that lead can displace hydrogen from acids. So, when lead reacts with hydrochloric acid, it displaces the hydrogen, creating a salt (lead chloride, $PbCl_2$) and liberating hydrogen gas. The chemical equation is:

• $Pb + 2HCl \rightarrow PbCl_2 + H_2$

• Silver (Ag), Copper (Cu), and Mercury (Hg) are all less reactive than hydrogen. They are below hydrogen in the reactivity series,

meaning they cannot displace hydrogen from an acid. Therefore, these metals will not react with dilute hydrochloric acid under normal circumstances, and hydrogen will not be liberated.

Additional Information

• Ag:

• Silver or Ag is a transition metal having atomic number 47.

• It is a lustrous element and is mostly found as silver ore.

• It lies very low in the electrochemical series, below Hydrogen.

• Hg:

• Hg or Mercury is also a transition metal having atomic number 80.

• It is very rare metal and exists in liquid form at room temperature.

• It also has a very low reduction potential; therefore, it cannot liberate Hydrogen.

• Pb:

• Lead or Pb is a chemical element with atomic number 82.

• Lead is not used in the preparation of hydrogen because lead reacts with dilute sulphuric or hydrochloric acid and forms an insoluble coating of lead sulphate or lead chloride.

Q42. Answer: (b) 26.25 km

Shortcut Trick

Since speed is constant, distance is directly proportional to time.

Ratio of time = 2 : 5

Ratio of distance = 2 : 5

2 units = 10.5 km => 1 unit = 5.25 km

5 units = 5 × 5.25 = 26.25 km

Therefore The correct answer is 26.25 km.

Alternate Method

Given:

Initial Distance (D1) = 10.5 km

Initial Time (T1) = 2 hours

Final Time (T2) = 5 hours

Formula Used:

Speed = Distance ÷ Time

Distance = Speed × Time

Calculations:

=> Speed = 10.5 ÷ 2

=> Speed = 5.25 kmph

=> Distance covered in 5 hours = 5.25 × 5

=> Distance = 26.25 km

Therefore The correct answer is 26.25 km.

Additional Information

Direct Proportionality

When speed is constant, distance (D) is directly proportional to time (T). Formula: D1/T1 = D2/T2.

Unit Conversion

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

Average Speed

If total distance and total time are given, Average Speed = Total Distance ÷ Total Time.

Q43. Answer: (c) Harmanpreet Kaur

The correct answer is Harmanpreet Kaur.

Key Points

• Harmanpreet Kaur and Smriti Mandhana were named captain and vice-captain of the Indian team ahead of the 2022 CWG in Birmingham.

• India's women's cricket team won a silver medal they lost a match against Australia by nine runs.

Additional Information

• The 2022 Commonwealth Games, officially known as the XXII Commonwealth Games.
• It is commonly known as Birmingham 2022, which was an international multi-sport event for members of the Commonwealth of Nations that took place in Birmingham, England.
• It started on 28 July and ended on 8 August 2022.
• India finished its Commonwealth Games 2022 campaign as the fourth-best country on the medals table.
• Winning a total of 61 medals, including 22 gold medals, 16 silver medals, and 23 bronze medals.
• Indian athletes won medals across 12 different sports that included a historic gold medal in lawn bowls.

Q44. Answer: (b) Three

The given series can be represented as:
So, there are 3 symbols in the series which are immediately preceded by a letter and also immediately followed by a number.
Hence, the correct answer is 'Three'.

Q45. Answer: (a) G

Given:
• Eight friends— A,B,C,D,E,F,G and H are sitting around a square table facing the center.
• four of them sit at four corners of the square while four sit in the middle of each of the four sides.
1)A is immediate right of H who is sitting at the exact center of one of the sides of the table. (H is any of the center)
(observing the direction from center of the square table)
2) D is immediate neighbor of A
(in neighbor of A only one seat is vacant)
3)B is sitting immediate right of D
(in neighbor of D only one seat is empty so there is only one possibility)
4) F is immediate neighbor of B and C
(this case is only possible when F is in between B and C)
5) E is sitting to the immediate left of G
Thus, G is immediate left of H.
Hence, the correct answer is "option 1".

Q46. Answer: (c) 8 years

Shortcut Trick
Total age after 5 years = 68 + (2 × 5) = 78 years.
Ratio of Man to Son after 5 years = 5 : 1.
Total units = 5 + 1 = 6 units → 78 years => 1 unit = 13 years.
Son's age after 5 years = 13 years => Present age = 13 − 5 = 8 years.
Therefore The correct answer is 8 years.
Alternate Method
Given: Sum of Present Ages = 68 years. Ratio after 5 years = 5 : 1.
=> Let Son's present age be s and Man's present age be m.
=> m + s = 68 => m = 68 − s
=> After 5 years: (m + 5) = 5 × (s + 5)
=> (68 − s + 5) = 5s + 25
=> 73 − s = 5s + 25
=> 6s = 48
=> s = 8 years.
Therefore The correct answer is 8 years.
Additional Information
Sum of Ages in Future
If the current sum of ages of 'n' persons is S, then after 't' years, the sum will be S + (n × t).
Age Ratio Property
The difference between the ages of two people remains constant regardless of the number of years passed.

Q47. Answer: (c) India

The correct answer is India.

Key Points

• The global hunger index is defined as a term for monitoring whether countries are achieving hunger-related SDGs.

• It is also used for international ranking.

• The index is released by two companies namely Concern Worldwide and Welthungerhilfe in every October.

• The Hunger Index which measures every country's performance based on four component indicators.

• They are undernourishment, child wasting, child stunting and child mortality.

Additional Information

• Global Hunger Index 2021

• Pakistan – 92

• Sri Lanka – 65

• Nepal – 76

• Bangladesh – 76

Important Points

• In the 2022 Global Hunger Index, India ranks 107th out of 121 countries.

Q48. Answer: (d) PHZJX

The positions of the letters according to the English alphabet series:

The pattern followed here is:

POWER : RRAJX

HELLO : JHPQU

Similarly, for NEVER

Hence, the correct answer is "PHZJX".

Q49. Answer: (b) Right to Constitutional Remedies

The correct answer is Right to Constitutional Remedies.

Key Points

• Article 32 deals with the 'Right to Constitutional Remedies'.

• It affirms the right to move the Supreme Court by appropriate proceedings for the enforcement of the rights conferred in Part III of the Constitution.

• It is a fundamental right, which states that individuals have the right to approach the Supreme Court (SC) seeking enforcement of other fundamental rights recognized by the Constitution.

Additional Information

• There are six fundamental rights of the Indian Constitution along with the constitutional articles related to them are mentioned below:

1. Right to Equality (Article 14-18)
2. Right to Freedom (Article 19-22)
3. Right against Exploitation (Article 23-24)
4. Right to Freedom of Religion (Article 25-28)
5. Cultural and Educational Rights (Article 29-30)
6. Right to Constitutional Remedies (Article 32)

Q50. Answer: (c) Satpura National Park

The correct answer is Satpura National Park.

Key Points

• Satpura National Park is the first reserve forest of India.

• Satpura National Park is a wildlife habitat located on the border of Satpura in the Hoshangabad district of Madhya Pradesh.

• It is surrounded by Bori and Pachmarhi Wildlife Sanctuaries.

• It was first introduced by the popular bird watcher Dr. Salim Ali in the year 1981.

• Terrain: Sandstone peaks, narrow valleys, ravines, and dense forests.

• Fauna: Indian giant squirrel, porcupine, hornbill, peacock.

• Flora: Sal, teak, tendu, Phyllanthus Emblica, medicinal plants.

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• The Denwa River is the main water source of the park.

Additional Information

• Jim Corbett National Park is situated in the forested wildlife sanctuary in northern India's Uttarakhand State.

• Rich in flora and fauna, it's known for its Bengal tigers. Animals, including tigers, leopards, and wild elephants, roam the Dhikala zone.

• Pench National Park is famous for its ferocious Bengal Tigers that boast a significant amount of tourism in the park.It is in Madhya Pradesh.

• Kaziranga National Park is a protected area in the northeast Indian state of Assam. It is regarded as one of the finest wildlife refuges in the world.

Q51. Answer: (a) 4.8 A

The correct answer is 4.8 A.

Key Points

Concept:

• Resistors in Series:

Two or more resistors are said to be connected in series when the same amount of current flows through all the resistors. In such circuits, the voltage across each resistor is different.

Rtotal = R1 + R2 + ... + Rn

• Resistors in Parallel:

Two or more resistors are said to be connected in parallel when the voltage is the same across all the resistors, but different amounts of current flow throw all the resistors.

1/(R_(total))= 1/R1 + 1/R2+ dotsb + 1/R_n

• Total Current in a circuit:

According to Ohm's law, the current is the ratio of the potential difference and the resistance. Thus, the current formula is given :

I = V/(R_(eq))

Calculation:

As in the given question, the resistors are connected in parallel, thus the equivalent resistance is :

1/(R_(eq)) = 1/4 + 1/8+1/6

1/(R_(eq)) = 1/0.545

R_(eq) = 1.84 ohm

Now, We have V = 9V and R = 1.84,

Thus, Total Current in the circuit is :

I = V/R

I = 9/1.84

I= 4.8 A

Hence, The correct answer is: '4.8A'

Q52. Answer: (c) 2 m in front of the mirror

The correct answer is 2m in front of the mirror.

Key Points

• The focal length of the concave mirror can be formed by the formula:

• 1over f = 1over V + 1over U

F = focal length of the mirror, V = image distance from the pole and U= object distance from the pole

Here, the focal length is -40 cm and the object distance is - 50 cm.

1over v = 1over f - 1over u

1over v = - 1over 40 - (- 1over 50)

1over v = - 1over 40 + 1over 50

1over v = 4-5over 200

1over v = - 1over 200, v =200cm (1m = 100 cm)

v = 2 m so, Its image will be formed at 2m in the front of the mirror.

j;pojil===f.

Q53. Answer: (b) 180

The logic followed here is:

Hence, the correct answer is '180'.

Q54. Answer: (a) 120°

Shortcut Trick

Since PQ || RS, the alternate interior angles are equal: angle RSQ = angle PQS = 60°.

Since QS || EF, the consecutive interior angles on the same side of the transversal RSF sum to 180°.

=> angle RSQ + angle RFE = 180°

=> 60° + angle RFE = 180°

=> angle RFE = 180° − 60° = 120°.

Therefore The correct answer is 120°.

Alternate Method

Given:

Line QS is parallel to line EF (QS || EF).

Line RS is parallel to line PQ (RS || PQ).

The measure of angle angle PQS is 60°.

Formula Used:

1. Alternate Interior Angles: When two parallel lines are intersected by a transversal, the alternate interior angles are equal.

2. Consecutive Interior Angles: When two parallel lines are intersected by a transversal, the sum of the interior angles on the same side is 180°.

Calculations:

=> Given PQ || RS and QS is the transversal.

=> angle RSQ = angle PQS (Alternate interior angles)

=> angle RSQ = 60°

=> Given QS || EF and RSF is a straight line acting as a transversal.

=> angle RSQ + angle RFE = 180° (Consecutive interior angles on the same side of transversal)

=> 60° + angle RFE = 180°

=> angle RFE = 180° − 60°

=> angle RFE = 120°

Therefore The correct answer is 120°.

Additional Information

Parallel Lines and Transversals

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

Properties of Parallelograms

If both pairs of opposite sides of a quadrilateral are parallel, it is a parallelogram. In a parallelogram, opposite angles are equal and adjacent angles are supplementary.

Q55. Answer: (c) acidic

The correct answer is ' Acidic'.

Key Points

• Oxides of Non-Metals are acidic in nature.

• When a Non-Metal reacts with Oxygen, it gives Oxide which on dissolution with water gives an acid.

• Such a molecule readily loses a proton from one of its hydroxyl groups because the resulting anion is highly stabilized by the oxygen atoms and the electronegative non-metal atom. Therefore, they are acidic.

Additional Information

• Most non-metal oxides are acidic, but not all. For example, carbon monoxide (CO) is not acidic.

• neutral:

• With a pH of 7, neutral substances don't change color when exposed to any indicator.

• Nature is neutral in pure water.

• basic:

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• Any material that is slippery to the touch, tastes unpleasant, alters the color of indicators (such as turning red litmus paper blue), combines with acids to generate salts, and facilitates certain chemical processes is considered a base in chemistry (base catalysis).

• amphoteric:

• Amphoteric refers to both an acid and a base.

• Amphoteric oxides exhibit both basic and acidic characteristics. Examples are the oxides of zinc and aluminium.

Q56. Answer: (d) angle of deviation

The correct answer is Angle of Deviation.

Key Points

• A glass prism is a transparent object having two triangular ends and three rectangular sides.

• When a ray of light enters the glass prism it gets deviated two times. First when it enters the glass prism and second when it comes out of the prism.

• This is because the refracting surfaces of the prism are not parallel to each other. Also, when the ray of light passes through the prism it bends towards its base.

• When a light ray first passed from a rarer medium to a denser medium, it bends toward the normal. Then it passes from a denser medium to a rarer medium, it bends away from the normal.

• The Angle of Deviation is in between the Angle of the Incident and the Angle of the Emergent ray.

Additional Information

• The angle is equal to the difference between the angle of incidence and the angle of refraction of a ray of light passing through the surface between one medium and another of different refractive index.

• The angle of deviation is given by the formula :

$\delta = (i1 + e) - A$

Here, i= angle of incidence, e= angle of emergence, and A= angle of prism.

Q57. Answer: (d) $CaCl2 + H2SO4 \rightarrow CaSO4 + 2HCl$

The correct answer is: $CaCl2+H2SO4 \rightarrow CaSO4+2HCl$

Key Points

• Balancing a Chemical Equation:

• When Calcium Chloride reacts with Sulphuric acid, It produces Calcium Sulphate and Hydrogen Chloride.

• $CaCl2+H2SO4 \rightarrow CaSO4+HCl$

• Now, there are 2 Hydrogen atoms on the reactant's side whereas only 1 hydrogen is atom on the product's side. To balance it, Multiply HCl by 2.

• $CaCl2+H2SO4 \rightarrow CaSO4+2HCl$

• This is a type of Double Displacement Reaction.

Additional Information

Types of Chemical Reactions	Explanation	General Reaction
Combination reaction	Two or more compounds combine to form one compound.	A + B → AB
Decomposition reaction	A complex molecule breaks down to make simpler ones.	AB → A+B
Precipitation reaction	Two solutions of soluble salts are mixed resulting in an insoluble solid (precipitate) forming.	A+ soluble salt B → precipitate + soluble salt C
Neutralization reaction	An acid and a base react with each other. Generally, the product of this reaction is salt and water.	Acid + Base → salt + water
Combustion reaction	Oxygen combines with a compound to form carbon dioxide and water. These reactions are exothermic.	$O2 + B \rightarrow CO2+H2O$
Displacement reaction	One element takes place with another element in the compound.	AB + C → AC + B

Q58. Answer: (c) 500 cm²

Shortcut Trick

Ratio of Sides = 8 : 10 = 4 : 5

Sum of ratio parts (L + B) = 4 + 5 = 9 units

Perimeter = 2 × (L + B) => 2 × 9 units = 18 units = 90 cm

1 unit = 5 cm => Sides are 20 cm and 25 cm

Area = 20 × 25 = 500 cm²

Therefore The correct answer is 500 cm².

Alternate Method

Given: Ratio of Length and Breadth = 8 : 10, Perimeter = 90 cm

Formula Used: Perimeter = 2 × (Length + Breadth); Area = Length × Breadth

=> Let the sides be 8x and 10x

=> 2 × (8x + 10x) = 90

=> 2 × 18x = 90

=> 36x = 90

=> x = 90 ÷ 36 = 2.5

=> Length = 10 × 2.5 = 25 cm

=> Breadth = 8 × 2.5 = 20 cm

=> Area = 25 × 20 = 500 cm²

Therefore The correct answer is 500 cm².

Additional Information

Properties of Rectangle

Opposite sides are equal and parallel, and each internal angle is 90°.

Diagonal of Rectangle

The length of the diagonal is given by d = √(L² + B²).

Area and Perimeter Relations

For a constant perimeter, a square has the maximum area among all rectangles.

Q59. Answer: (b) 8

Given:

According to the given diagram, there are 8 married males who are school teachers.

Hence, the correct answer is '8'.

Q60. Answer: (d) 10,000 kJ

The correct answer is 10,000 kJ.

Key Points

• The sequence of events in an ecosystem known as a "food chain" occurs when one live organism eats another organism, which is then eaten by a larger organism.

• A food chain is created by the transfer of nutrients and energy from one creature to another at various trophic levels.

• The flow of nutrients and energy through an ecosystem is described by a food chain.

• Energy is first produced by plants at the most fundamental level, and then it is used by higher-level species like herbivores.

• Energy is then transmitted from one carnivore to the next when they eat the herbivores.

• There is only 10% flow of energy from one trophic level to the next higher level.

• The loss of energy at each step is so great that very little usable remains after four or five trophic levels.

• Hence only 4 to 5 trophic levels are present in each food chain.

Additional Information

• A food network often ends with apex predators at trophic levels 4 or 5. A food web begins at trophic level 1 with primary producers like plants, then can migrate to herbivores at level 2, carnivores at level 3 or above, and so on.

• The different trophic levels are:

• First Trophic Level: Autotrophs

• Second Trophic Level: Primary Consumers

• Third Trophic Level: Secondary Consumers

• Fourth Trophic Level: Tertiary Consumers

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• Fifth Trophic Level: Quaternary Consumers

Q61. Answer: (b) J

Boxes: J, K, L, M, N and O

According to the given information:

• M is the top-most box & O is the bottom-most box.

• J is kept immediately above N and only one box is kept between K and O.

Finally, we get

So, the box, J is kept immediately below M.

Hence, the correct answer is 'option 2'.

Q62. Answer: (d) 46 lakhs

GIVEN:-

In 2013-

Population of state A = 40 lakhs

Population of state B = 38 lakhs

In 2018-

Population of state A = 52 lakhs

Population of state B = 72 lakhs

CALCULATIONS-

Total population of state A and B in 2013= 40 + 38= 78 lakhs

Total population of state A and B in 2018= 72 + 52= 124 lakhs

Total difference in 2013 and 2018= 124 - 78= 46 lakhs

Therefore The difference in state A and B's population in 2013 and 2018 is 46 lakhs.

Q63. Answer: (b) 17

Given: A W S X Z E C D R V F T B H N M H Y J K I O L

According to the given information, the letter that is third from the left end is S and the second vowel from the right end is I.

The logic followed here is:

So, there are 17 letters between S and I.

Hence, the correct answer is 'option 2'.

Q64. Answer: (d) 7560

Shortcut Trick

The product of two numbers is always equal to the product of their HCF and LCM.

Product of numbers = 1080 × 30240

Other number = (1080 × 30240) ÷ 4320

Other number = 30240 ÷ 4 = 7560 (since 4320 = 1080 × 4)

Therefore The correct answer is 7560.

Alternate Method

Given:

HCF of two numbers = 1080

LCM of two numbers = 30240

First number (a) = 4320

Formula Used:

Product of two numbers (a × b) = HCF(a, b) × LCM(a, b)

Calculations:

=> 4320 × b = 1080 × 30240

=> b = (1080 × 30240) ÷ 4320

=> b = 32659200 ÷ 4320

=> b = 7560

Therefore The correct answer is 7560.

Additional Information

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LCM and HCF Relationship

For any two positive integers a and b, LCM(a, b) × HCF(a, b) = a × b.

Divisibility Property

The HCF of any set of numbers always divides their LCM exactly without leaving a remainder.

HCF of Co-prime Numbers

Two numbers are said to be co-prime if their Highest Common Factor (HCF) is 1. Their LCM is simply the product of the numbers.

Q65. Answer: (b) B3 > B2 > B1

The correct answer is B3 > B2 > B1.

Key Points

• The magnitude of a magnetic field at a point at distance r from a straight conductor carrying current 'I' is:

• B = u0/2π I/r

• As the magnitude of the magnetic field directly depends upon the current carried by the straight conductor.

• Thus, the higher the current carried by the conductor, the higher will be the magnitude of the magnetic field at a point at distance r.

Thus, In the given problem, B3>B2>B1, as the current is 3I>2I>I.

Q66. Answer: (a) 20

Symbols	•	•	×	÷
Code	•	•	÷	×

17 - 3 ÷ 2 + 12 × 4 = ?

After converting the symbols with given code the equations will be:

→ 17 + 3 × 2 - 12 ÷ 4

= 17 + 3 × 2 - 3

= 17 + 6 -3

= 23 - 3

= 20

Hence, the correct answer is '20'.

Q67. Answer: (c) CADACF

After filling the blanks with by given option :

1. CDFCCA: Doesn't follow any pattern.

2. CDADFA: Doesn't follow any pattern.

3. CADACF : It follows a certain Pattern, Here last letter of word is increasing by +1.

A+ 1 = B, B + 1 = C, C + 1 = D.

4 CADFCC : Doesn't follow any pattern.

Hence correct answer is 'CADACF'.

Q68. Answer: (a) 28

Shortcut Trick

List the first five prime numbers starting from 2.

Prime numbers are: 2, 3, 5, 7, 11.

Sum → 2 + 3 + 5 + 7 + 11 = 28.

Therefore The correct answer is 28.

Alternate Method

Given: Need to find the sum of the first five prime numbers.

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

=> 1^(st) Prime Number = 2

=> 2^(nd) Prime Number = 3

=> 3^(rd) Prime Number = 5

=> 4^(th) Prime Number = 7

=> 5^(th) Prime Number = 11

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=> Total Sum = 2 + 3 + 5 + 7 + 11

=> Total Sum = 28

Therefore The correct answer is 28.

Additional Information

Smallest Prime Number

2 is the smallest and the only even prime number.

Composite Numbers

Numbers that have more than two factors are composite numbers. 1 is neither prime nor composite.

Co-Prime Numbers

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

Q69. Answer: (a) Wednesday

Given that:

The day on 7th September 2012 is Friday.

• No of days from 7 September to 17 December = 23 + 31 + 30 + 17 = 101

• Since, it was Friday on 7th September 2012, every 7th day from 7th September will be a Friday.

• Thus, no. of odd days = 101/7 = 3 odd days.

• Now,7 September 2012 (Friday) + 3 odd days = 17 December 2012 (Monday)

• The day on 17 December 2014 = 17 December 2012 + 2 days (Every year a date get shifts forward to the Next day. That means after 2 years, would shift ahead by 2 days.)

• The day on 17 December 2014 is Wednesday.

Hence, "Option 1" is the correct answer.

Q70. Answer: (b) Both A and B

The correct answer is Both A and B.

Key Points

• Money - an active medium of exchange that consists of coins and banknotes; both of these items are taken together.

• Functions of Money.

• Medium of exchange - Money can be used as a medium of exchange for all types of transactions involving products and services.

• The measure of value - Money is used as a unit of measurement for value. All commodities and services have a monetary value that can be stated.

• Storage of value - A store of value simplifies a store of wealth. Money can be stored for future use.

Q71. Answer: (c) W > Z

Statement:

• F > N ≥ Z ≤ S = B < W

Conclusions:

• 1. F > S → False

• As F > Z ≤ S

• a definite relation between F and S cannot be determined.

• 2. N > B → False

• As N ≥ Z ≤ S = B

• a definite relation between N and B cannot be determined.

• 3. W > Z → True

• F > N ≥ Z ≤ S = B < W → Z ≤ S = B < W → Z < W

• Hence, only conclusion 3 is true.

• 4. N ≥ W → False

• As N ≥ Z ≤ S = B < W

• a definite relation between W and T cannot be determined)

Hence, correct option is W > Z

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Q72. Answer: (d) 4

The given Venn diagram is

To find the number of Female Scientists who are NOT Urban ,We have to consider an intersection of upper left circle and lowest Circle

and neglect upper Right Circle because it represents Urban members as shown in the figure above.

Hence, the correct answer is 4.

Q73. Answer: (a) Less than least resistance

The correct answer is Less than least resistance.

Key Points

• Resistors are said to be connected together in “Parallel” when both of their terminals are respectively connected to each terminal of the other resistor or resistors.

• There are two paths available for Current.

• Hence current divides, but the voltage across the resistors is the same.

• If the two resistors are equal the current will divide equally and the R-total will be exactly half of either resistor or exactly one-third if there are three equal resistors.

1/R_eq= 1/R + 1/R

1/R_eq= 2/R

R_eq= R/2

Hence, Equivalent resistance in a parallel connected resistor combination is always less than the least resistance.

Q74. Answer: (a) 11 : 5

Shortcut TrickApply Componendo and Dividendo rule on the given ratio (a + b) / (a − b) = 8 / 3.Greater number (a) = 8 + 3 = 11 units.Smaller number (b) = 8 − 3 = 5 units.Required Ratio = 11 ÷ 5.Therefore The correct answer is 11 ÷ 5.Alternate MethodGiven: Ratio of sum to difference = 8 : 3Formula Used: Ratio = (Sum + Difference) / (Sum − Difference)=> Let the numbers be x and y (where x > y).=> (x + y) / (x − y) = 8 / 3=> 3(x + y) = 8(x − y)=> 3x + 3y = 8x − 8y=> 8y + 3y = 8x − 3x=> 11y = 5x=> x / y = 11 / 5Therefore The correct answer is 11 ÷ 5.Additional InformationComponendo and DividendoIf a/b = c/d, then (a + b)/(a − b) = (c + d)/(c − d). This is a very useful property in Ratio and Proportion to isolate variables.Finding Numbers from Sum and DifferenceIf Sum = S and Difference = D, then the Greater number = (S + D)/2 and the Smaller number = (S − D)/2.Inverse ProportionIf ax = by, then the ratio x : y is equal to the inverse ratio of their coefficients, which is b : a.

Q75. Answer: (a) Nine

According to the given information:

1). Only One person is taller than E

__ > E

2). C is shorter than E and taller than B, who is taller than F.

__ > E > C > B > F

3). A is taller than D, but shorter than F

__ > E > C > B > F > A > D

4). Only two persons shorter than D

E > C > B > F > A > D > > __

And, no other person is part of the group,

So, there are 'Nine' people in the group.

Hence, "Nine" is the correct answer.

Q76. Answer: (d) Only I can be concluded from the given information.

Statement:

'In order to minimize the consumption of plastic bags, the supermarkets across a metro city X have announced that all their customers need to bring their own bags or will have to buy jute bags from the supermarket that cost Rs. 13 per bag.'

Conclusion I : The revenue of plastic bag manufacturing companies catering to city X may reduce to some extent. - True (Due to thee announcement made by supermarket the overall consumption of plastic bags may decrease therefore the production of plastic bags may affected hence the revenue of plastic manufacturing companies may decrease.)

So, Conclusion I does follow.

Conclusion II : The smaller general stores across city X will not need to ban plastic bags. False (As city X trying reduce plastic bags comsumption hence small generals store need to step forward and ban the plastic bags)

So, Conclusion II does not follow.

Hence, Only I can be Concluded from given information.

Q77. Answer: (b) Amit Singh

The correct answer is Amit Singh.

Key Points

• Prof Amit Singh has received the Shanti Swarup Bhatnagar Prize in Biological Sciences, 2021.

• He is a Professor in the Department of Microbiology and Cell Biology (MCB), and the Centre for Infectious Disease Research (CIDR).

• His work has led to an understanding of the intricate connection forged between redox metabolism, bioenergetics, and persistence in human pathogens.

Additional Information

• CSIR's Bhatnagar award sent to 37 scientists by post.

Q78. Answer: (d) Villi

The correct answer is Villi.

Key Points

• Intestinal Villi are small, finger-like projections that extend into the lumen of the small intestine.

• The inner lining of the small intestine has many finger-like projections called villi.

• Each villus is covered by a layer of epithelium and contains blood vessels and lymphatic vessels.

• Villi increase the surface area of the small intestine to absorb nutrients.

• Each Villus is approximately 0.5-1.6 mm in length.

• It also helps the intestine to move food along the digestive pathways.

Additional Information

• Sphincters: A ring-shaped muscle that relaxes or tightens to open or close a passage or opening in the body. Examples are the anal sphincter (around the opening of the anus) and the pyloric sphincter (at the lower opening of the stomach).

• Glands: An organ that makes one or more substances, such as hormones, digestive juices, sweat, tears, saliva, or milk.

• Cilia: They are small, slender, hair-like structures present on the surface of all mammalian cells. They are primitive in nature and could be single or many. Cilia play a major role in locomotion.

Q79. Answer: (c) north

The correct answer is 'north'.

Key Points

• Maxwell’s right hand thumb rule states that, when the current flows from east to west direction, the magnetic field will move in a clockwise direction, that is, from the direction north to south. Similarly, when the current flows from west to east direction, the magnetic field will move in an anti-clockwise direction, that is, from the direction south to north.

Additional Information

• Right hand thumb rule states that whenever there is a conductor and current is flowing in that conductor, then assume as if you are holding the conductor in your right hand with thumb pointing in the direction of current. With such an orientation of right hand, curl of fingers will give direction of magnetic field.

Q80. Answer: (a) 35

Shortcut Trick

Total ratio parts = 4 + 5 = 9 units.

Total chocolates = 63.

1 unit = 63 ÷ 9 = 7 chocolates.

B gets = 5 units × 7 = 35 chocolates.

Therefore The correct answer is 35 chocolates.

Alternate Method

Given:

Total quantity = 63

Ratio A : B = 4 : 5

Formula Used:

Share of B = [Ratio of B ÷ (Sum of Ratios)] × Total quantity

Calculations:

=> Sum of ratio parts = 4 + 5 = 9

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=> Share of B = (5 ÷ 9) × 63

=> Share of B = 5 × 7

=> Share of B = 35

Therefore The correct answer is 35 chocolates.

Additional Information

Ratio Division Rule

To divide a quantity X in the ratio a:b, the parts are [a/(a+b)]×X and [b/(a+b)]×X.

Compound Ratio

For two ratios a:b and c:d, the compound ratio is (ac):(bd).

Proportion

If a:b = c:d, then ad = bc, where d is the fourth proportional.

Q81. Answer: (d) OPRST

The pattern of the code is arranged in ascending order by position value of these alphabets.

Similarly, For the word SPORT

Hence, The correct answer is OPRST.

Q82. Answer: (d) Carbon monoxide

The correct answer is 'carbon monoxide.'

Key Points

• Zinc oxide reacts with carbon, on heating, to form zinc metal and carbon monoxide.

• Zinc Oxide (ZnO) oxidised C to CO and itself reduced to Zn. C reduced ZnO to Zn and itself get oxidised to CO.

• The balanced chemical reaction :

• ZnO + C→ CO+ Zn

Additional Information

• In a redox reaction, oxidizing agents are a reactant that gains electrons while being reduced. Here, the oxidizing agent is zinc oxide, which turns carbon into carbon monoxide.

• In a chemical reaction, a substance that reduces or loses an electron and becomes oxidized is known as a reductant or reducing agent. In this case, the reducing agent is carbon, which converts zinc oxide to zinc.

Q83. Answer: (b) 37/38

Given:

• 1.5x=0.02y

• 1over ((y+x)/(y-x))

Concept used:

• Substitution method

Calculations:

We know that,

1.5x=0.02y; y=1.5x/0.02; y=75x

Now, according to the question,

1over ((y+x)/(y-x)) ; =1/((75x+x)/(75x-x)); =1/(76x/74x); =74x/76x; =37/38

Therefore, The correct answer is option 2.

Q84. Answer: (c) 219/11

Shortcut Trick

Initial speed = (20 km ÷ 24 min) × 60 = 50 km/h.

New speed = 50 + 5 = 55 km/h.

New time = (20 km ÷ 55 km/h) × 60 = 240/11 minutes.

240/11 = 21(9/11) minutes.

Therefore The correct answer is 21(9/11) minutes.

Alternate Method

Given: Distance = 20 km, Initial Time = 24 minutes.

Formula Used: Speed = Distance ÷ Time; Time = Distance ÷ Speed.

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=> Initial Time in hours = 24 ÷ 60 = 2/5 hours.

=> Initial Speed (S1) = 20 ÷ (2/5) = 20 × (5/2) = 50 km/h.

=> Increased Speed (S2) = 50 + 5 = 55 km/h.

=> New Time (T2) = Distance ÷ S2 = 20 ÷ 55 = 4/11 hours.

=> New Time in minutes = (4/11) × 60 = 240/11 minutes.

=> 240 ÷ 11 = 21 with remainder 9 = 21(9/11) minutes.

Therefore The correct answer is 21(9/11) minutes.

Additional Information

Inverse Proportion of Speed and Time

When distance is constant, speed is inversely proportional to time (S1/S2 = T2/T1). In this case, Speed ratio 50:55 = 10:11, so Time ratio = 11:10.

Unit Conversion

To convert km/h to m/s, multiply by 5/18. To convert minutes to hours, divide by 60.

Average Speed

For two equal distances covered at speeds x and y, Average Speed = (2 × x × y) ÷ (x + y).

Q85. Answer: (d) 2

Shortcut Trick

Apply complementary angle identities where θ + φ = 90°:

=> cosec 57° = sec 33° and cot 57° = tan 33°

=> cot 43° = tan 47°

Substitute these into the expression: (sec 33° × sec 33°) − (tan 33° × tan 33°) + (cot 47° × tan 47°)

= (sec^2 33° − tan^2 33°) + (1) = 1 + 1 = 2.

Therefore The correct answer is 2.

Alternate Method

Given: sec 33° cosec 57° − cot 57° tan 33° + cot 47° cot 43°

Formula Used:

1. cosec(90° − θ) = sec θ

2. cot(90° − θ) = tan θ

3. sec^2 θ − tan^2 θ = 1

4. tan θ × cot θ = 1

Calculations:

=> Term 1: sec 33° cosec 57° = sec 33° × cosec(90° − 33°) = sec 33° × sec 33° = sec^2 33°

=> Term 2: cot 57° tan 33° = cot(90° − 33°) × tan 33° = tan 33° × tan 33° = tan^2 33°

=> Term 3: cot 47° cot 43° = cot 47° × cot(90° − 47°) = cot 47° × tan 47° = 1

=> Value = (sec^2 33° − tan^2 33°) + 1

=> Value = 1 + 1 = 2

Therefore The correct answer is 2.

Additional Information

Complementary Angles

Two angles are complementary if their sum is 90°. Key ratios include sin θ = cos(90° − θ), tan θ = cot(90° − θ), and sec θ = cosec(90° − θ).

Pythagorean Identities

Standard identities: sin^2 θ + cos^2 θ = 1, 1 + tan^2 θ = sec^2 θ, and 1 + cot^2 θ = $cosec^2$ θ.

Product Relations

The product of a trigonometric ratio and its reciprocal is always 1 (e.g., sin θ × cosec θ = 1, cos θ × sec θ = 1, tan θ × cot θ = 1).

Q86. Answer: (d) pH more than 7

The correct answer is pH more than 7.

Key Points

• The cations of strong acids do not hydrolyze and therefore the solutions of salts formed by strong acids and strong bases are neutral, i.e. their pH is 7, whereas the solutions of salts formed by strong bases and weak acids are alkaline, i.e. their pH>7.

• Salts that are from strong bases and weak acids do hydrolyze, which gives them a pH greater than 7.

• The pH value range of a weak base is 7.1 to 10 whereas a strong base is 10.1 to 14.

• All substances can be classified as neutral (with a pH of about 7), basic (pH greater than 7), or acidic (pH less than 7), and the pH tells us how strong or weak that substance is as well. For example, a substance with pH = 8 is a very weak base, but a substance with pH = 3 is a strong acid.

Q87. Answer: (c) Rs. 625

Given:

• Number of products = 500

• Direct labor cost= Rs.62500

• Profit percentage =50%

Formula used:

• Profit percentage =Profit/(Cost price)×100

• Profit= selling price- cost price

Calculation:

Let x be the total cost price of 500 products.

We know that,

Direct labour cost is 30% of the total cost price of 500 products,

30%× x = 62500; 30/100× x=62500; x=(62500× 100)/30; x=208333.33

The cost price of one product is,

= x/500

= 208333.33/500

= 416.67

Now,

Selling price = Cost price × (100 + Profit%)/100

Selling price = 416.67 × (100 + 50)/100 = 625

Selling price = Rs. 625

Therefore, the correct answer is option 3.

Q88. Answer: (b) Elimination of waste by sweating

The correct answer is' Elimination of waste by sweating.'

Key Points

• The stomata found on the surfaces of the leaves are used to eliminate gaseous wastes like carbon dioxide during the night.

• Certain excretory wastes collect in the cell's vacuoles where they eventually transform into gum and resin.

• Old xylem tissues, which eventually droop or wither away, show these wastes.

• Waste materials are eliminated through diffusion in plants.

• Oxygen, a byproduct of photosynthesis, is expelled by plants.

• Transpiration is how plants get rid of water.

• Waste materials could be kept in vacuoles or in shedding leaves.

• Waste materials including gums, oils, latex, and resins are kept in plant components like barks, stems, and leaves.

• Plants eventually shed these components.

• Other types of accumulated waste products include the oil made from orange, eucalyptus, jasmine, latex from rubber trees, papaya trees, and gums from acacia trees.

Additional Information

• Various Types of Excretion in Plants:

• Stomatal Transpiration: The deficiency of water from leaves through stomata.

• Cuticular Transpiration: The deficiency of water through the fingernail skin of a leaf.

• Lenticular Transpiration: The deficiency of water from lenticels-minute openings on the stem.

Q89. Answer: (a) 14

Shortcut Trick

Assume a base mean of 14 and find deviations: (3−14), (6−14), (8−14), (10−14), (12−14), (14−14), (18−14), (24−14), (31−14).

Deviations: −11, −8, −6, −4, −2, 0, +4, +10, +17.

Sum of deviations: (−11 − 8 − 6 − 4 − 2) + (4 + 10 + 17) => −31 + 31 = 0.
Net deviation ÷ Number of items = 0 ÷ 9 = 0.
Actual Mean = Assumed Mean + 0 = 14.
Therefore The correct answer is 14.
Alternate Method
Given Observations: 3, 6, 8, 10, 12, 14, 18, 24, 31
Total Number of observations (n): 9
Formula Used: Arithmetic Mean = (Sum of all observations) ÷ (Total number of observations)
=> Sum = 3 + 6 + 8 + 10 + 12 + 14 + 18 + 24 + 31
=> Sum = 126
=> Arithmetic Mean = 126 ÷ 9
=> Arithmetic Mean = 14
Therefore The correct answer is 14.
Additional Information
Median of Data
For odd number of observations (n), Median is the ((n + 1) ÷ 2)^(th) term when arranged in ascending order.
Empirical Relationship
Mode = 3 × Median − 2 × Mean. This connects the three measures of central tendency.
Range of Data
Range = Maximum value − Minimum value. In this case: 31 − 3 = 28.

Q90. Answer: (b) (7, 12, 17)

logic :
In the set given numbers the second number is the mean of first and third number.
that is, Second number = [(First number) + (Third number)] / 2
(6,7,8)
(6+8)/2 = 14/2 = 7
(23,34,45)
(23+45)/2 = 68/2 = 34
Similarly,
1) (8,19,28)
(8+28)/2 = 36/2 = 18 which is not equal to 18,second number.
hence, does not follow pattern.
2) (7,12,17)
(7+17)/2 = 24/2 = 12 which is equal to second number
hence, follows the sequence.
3) (3,4,9)
(3+9)/2 = 11/2 = 5.5 which is not equal to 4,second number.
hence does not follows the pattern.
4) (17,22,25)
(17+25)/2 = 42/2 = 21 which is not equal to second number.
hence does not fallows a pattern.
Only (7,12,17) follows the pattern. Hence, The correct answer is (7,12,17).

Q91. Answer: (c) 1993

The correct answer is 1993.
Key Points
• 73rd and 74th Constitutional Amendments were passed by Parliament in December 1992.
• Through these amendments, local self-governance was introduced in rural and urban India.
• The Acts came into force as the Constitution (73rd Amendment) Act, 1992 on April 24, 1993, and the Constitution (74th Amendment) Act, 1992 on June 1, 1993.
• These amendments added two new parts to the Constitution, namely, the 73rd Amendment added Part IX titled “The Panchayats” and the 74th Amendment added Part IXA titled “The Municipalities”.

Q92. Answer: (d) Yes, the long tube gives time and space for re-absorption of excess water from the initial filtrate.

The correct answer is ' Yes, the long tube gives time and space for re-absorption of excess water from the initial filtrate.'

Key Points

• The urine will be increasingly concentrated the further the nephron loop descends into the medulla.

• The renal medulla is home to the lengthy nephron loops of the juxtamedullary nephrons.

• An osmotic gradient is created and kept constant by these countercurrent mechanisms, ranging from the cortex to the medulla's deepest layers.

• Animals from the desert have longer Henle loops in their kidneys to increase urine concentration and reduce salt and water loss.

• This enables desert animals to survive for extended periods of time with little water.

• The Henle loop refers to this area of the nephron. Its major job is to reabsorb sodium chloride and water from the filtrate.

• By conserving water, the organism can produce urine that is extremely concentrated.

Q93. Answer: (a) (21, 105, 189)

Logic:

• (First Number) × 5 =(Second Number)

• (First Number) × 9 = (Third Number)

In (6,30,54) →

• 6 × 5 = 30

• 6 × 9 = 54

In (16,80,144) →

• 16 × 5 = 80

• 16 × 9 = 144

Let us check each option:

1. (21,105,189) →

• 21 × 5 = 105

• 21 × 9 = `189

Here all 3 numbers have the same relation as set of numbers given in question.

2. (8,35,72) →

• 8 × 5 = 40 which is not equal to 35

• 8 × 9 =72

3. (12,48,108) →

• 12 × 5 = 60 which is not equal to 48

• 12 × 9 = 108

4. (15,75,105) →

• 16 × 5 = 75

• 16 × 9 = 135 which is not equal to 105

Hence, only (21,105,189) have the same relation as given in question.

therefore, the correct answer is Option(1).

Q94. Answer: (c) PbO

The correct answer is 'Pbo'.

Key Points

• Lead nitrate breaks down into Lead oxide (PbO), oxygen (O2), and nitrogen dioxide (NO2) when heated.

• When lead nitrate is heated, lead monoxide, nitrogen dioxide, and oxygen are produced.

• Light yellow solid lead monoxide, reddish-brown nitrogen dioxide gas, and colorless oxygen gas are the byproducts of its breakdown.

• The balanced reaction is :

• $2Pb(NO3)2 \rightarrow 2 PbO + 4NO2 + O2$

Q95. Answer: (c) 2

The given word MASTER and its positional value given in the table and its pairs in forward directions:

Forward pairs (Left to Right): MR, ST

There are only two pair of words are present.

The correct answer is 2.

Q96. Answer: (d) At the extreme left end

The sitting arrangement here is:

1. Only I is seated between L and M.

2. K is seated 2nd from the left end and is not an immediate neighbour of M.

Here, case 1 and 3 will be eliminated because there is no space left at 2nd position from the left.

3. Seating arrangement of J: After arranging everyone, only the extreme left hand is vacant, thus J will be seated at the extreme left end.

Hence, the correct answer is 'Option 4'.

Q97. Answer: (a) Chambal

The correct answer is Chambal.

Key Points

• The Banas is a river that lies entirely within the state of Rajasthan in western India.

• It is a tributary of the Chambal River, itself a tributary of the Yamuna, which in turn merges into the Ganga.

• The Banas is approximately 512 kilometres in length.

Additional Information

• Banas River is known as the Van Ki Asha (Hope of the forest).

• Banas river originated from Veron ka Math.

• Chambal river originated from Janapav.

• The chambal river meets the Yamuna river at the Etawah district.

Q98. Answer: (d) Henry Lui Vivian Derozio

The correct answer is Henry Lui Vivian Derozio.

Key Points

• The Young Bengal Movement was introduced by Henry Louis Vivian Derozio.

• Henry Vivian Derozio and the Young Bengal movement:

• Henry Vivian Derozio was the leader of the Young Bengal Movement

• He was a teacher at the Hindu College, born in 1809 to a Portuguese father and Indian mother

• Derozio joined the college at 17 and taught there until 1831

• He was influenced by the ideals of liberty, equality, and fraternity

• Derozio drew a group of intelligent students around him, inspiring them to think freely and critically

• He organized debates and discussions on literature, philosophy, history, and science to spread radical ideas

• His followers, the Derozians, condemned religious practices and called for social reform, including female education and the empowerment of women

• Derozio was a poet, teacher, journalist, and reformer, and is considered by some to be the first nationalist poet of modern India

• Due to his radicalism, he was removed from the Hindu College and died at the young age of 22.

Additional Information

• Keshab Ch. Sen:-

• Keshub Chandra Sen was a Hindu philosopher and social reformer who attempted to incorporate Christian theology within the framework of Hindu thought.

• Born a Hindu in the Bengal Presidency of British India, he became a member of the Brahmo Samaj in 1857 but established his own breakaway "Bharatvarshiya Brahmo Samaj" in 1866 while the Brahmo Samaj remained under the leadership of Debendranath Tagore (who headed the Brahmo Samaj till his death in 1905).

• Ishwar Chandra Vidyasagar:

• He was Born Ishwar Chandra Bandyopadhyay in 1820 in West Bengal, he was awarded the title of Vidyasagar in 1839 for his mastery of Sanskrit and philosophy.

• At the age of twenty-one, Ishwar Chandra joined Fort William College as the HOD of Sanskrit.

• He participated in the Tatwabodhini Sabha.

• He established 20 model schools in Hooghly, Midnapore, Burdwan and Nadia.

• Due to his efforts Government of India passed the Widow Remarriage Act in 1856.

• Swami Dayananda Saraswati

• Maharshi Dayanand Saraswati was an Indian champion, social leader ,and author of the Arya Samaj, a reform movement of the

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Vedic dharma.

• He was the first to give the call for Swaraj as" India for Indians" in 1876, a call latterly taken up by Lokmanya Tilak.

• Denouncing the deification and ritualistic deification, he worked towards reviving Vedic testaments. latterly, the champion and President of India, S. Radhakrishnan called him one of the" makers of ultramodern India", as did Sri Aurobindo.

Q99. Answer: (c) P=V/I

The correct answer is P=V/I.

Key Points

• The electric power is given by P = VI, where V is the potential difference, I is the electric current and P is the electric power.

• The unit of electrical power is the watt.

• 1 W is the power consumed by a device that carries 1 A of current when operated at a potential difference of 1 V.

Additional Information

• It is the rate at which work is done or energy is transformed in an electrical circuit. Simply put, it is a measure of how much energy is used in a span of time. In physics, the rate of transfer of electrical energy by an electrical circuit per unit of time is called an electrical power.

• Electrical power is the product of voltage times current.

Q100. Answer: (d) SERB-POWER

The correct answer is SERB-POWER.

Key Points

• SERB - POWER is the Promoting Opportunities For Women in Exploratory Research.

• This program is formulated to mitigate gender disparity in science and engineering research funding in various S&T programs in Indian academic institutions and R&D Laboratories.

• SERB - POWER is specially designed to provide structured effort toward enhanced diversity in research to ensure equal access and weighted opportunities for Indian women scientists engaged in research and development activities.

Additional Information

• The SERB-Core Research Grant(CRG) Platform will be used to identify and support women scientists under the POWER Research Grant component. Accordingly, proposals will be received through two streams:

• Stream 1: Direct Applications for POWER Grant(Online).

• Stream 2: Applications sourced from CRG Scheme(All PACs).

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