RRB Group D Previous Year Paper (Held on: 24 Aug 2022 Shift 2)

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

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CBT

Q1. A ray of light is incident on the pole of a concave mirror. The acute angle between the incident ray and the principal axis will be called:

(a) angle of emergence
(b) angel of incidence
(c) angel of reflection
(d) angel of deviation

Q2. Each of P, Q, R, S, T, U and V has an exam on a different day of a week starting from Monday and ending on Sunday of the same week. Only three persons have exams between R and V. Only two persons have exams between Q and P. V's exam is on Saturday. Q's exam is immediately before R. Only U's exam is between P and V. T's exam is not held on Wednesday. Q's exam is on Monday. On which day is S's exam held?

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

Q3. On 14 February 2022, ISRO successful launched its first earth observation satellite of 2022, EOS-04. It was launched by which rocket?

(a) PSLV-C54
(b) PSLV-C53
(c) PSLV-C52
(d) PSLV-C51

Q4. If '+' means '-', '-' means '÷', '÷' means '×' and '×' means '+', what will come in place of the question mark (?) in the following equation?

21 + 48 - 8 × 6 ÷ 4 = ?

(a) 38
(b) 40
(c) 37
(d) 39

Q5. Select the option that is related to the fifth letter-cluster in the same way as the second letter-cluster is related to the first letter-cluster and the fourth letter-cluster is related to the third letter-cluster.

NECTAR : TCVEGP :: POCKET : VGMEQR :: MONKEY : ?

(a) AGMPQO
(b) AGMRSO
(c) BHMPQP
(d) AFMPQN

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Q6. How many language universities are located in India as on June 2022?

(a) 20
(b) 6
(c) 16
(d) 26

Q7. If a coil of a conductor with 50 Ω resistance is subjected to time varying magnetic field such that the EMF induced is 5 V, then the induced current in the coil is:

(a) 0.1 A
(b) zero
(c) 0.01 A
(d) infinite

Q8. Simplify: (2/3 + 1/3) × 23 - 13 + 6.

(a) 16
(b) 29
(c) 10
(d) 23

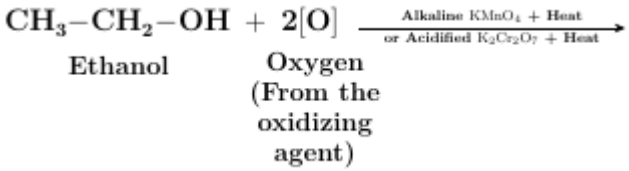
Q9. In which group helium is included.?

(a) Pnictogen group
(b) Chalcogen group
(c) Halogen group
(d) Noble gas group

Q10. Name India's lone participant in the winter Olympics, who finished 45^(th) in the giant slalom event.

(a) Aanchal Thakur
(b) Shailaja Kumar
(c) Arif Khan
(d) Himanshu Thakur

Q11. The product for the following reaction will be:



(a) CH3COOH
(b) CH3CHO
(c) CH3COOCH3
(d) CH2=CH2

Q12. In which year did the Indira Gandhi Government devalue the India Rupee?

(a) 1956
(b) 1966
(c) 1978
(d) 1970

Q13. In which year was The Municipal Corporation in Calcutta set up by a royal charter?

(a) 1736
(b) 1688
(c) 1726
(d) 1687

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Q14. If '+' means '-', '-' means '÷', '÷' means '×' and '×' means '+', what will come in place of the question mark (?) in the following equation?

24 - 3 × 12 + 4 ÷ 3 = ?

(a) 11
(b) 8
(c) 10
(d) 12

Q15. Which of the following materials is preferably used for electrical transmission lines?

(a) Nichrome
(b) Tungsten
(c) Tin-lead alloy
(d) Copper

Q16. A statement is given followed by two arguments I and II. Read the statement and the arguments carefully and select the appropriate answer from the given options.

Statement:

Private schools have increased their fees by 20 per cent for this academic year citing rising costs.

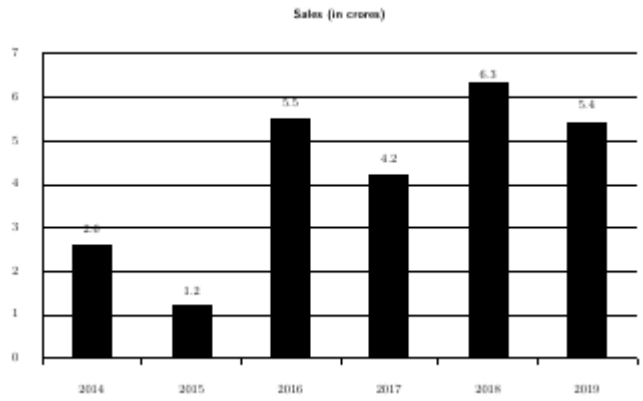
Arguments:

I. The government has lowered the taxes levied on private schools by 8 percent this year.

II. The Teacher's Union is protesting against the decision of private schools to cut salaries by 15 percent.

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

Q17. The following chart shows the sales of Company-A in various years from 2014 to 2019. Study the chart and answer the question.



In which years was the sale below the average sale of all the six years?

(a) Only 2014
(b) Only 2014 and 2017
(c) Only 2014 and 2015
(d) 2014, 2015 and 2016

Q18. Find the cost of fencing of a rectangular land, if it has an area of 100 m² and one side of length 20 m at a rate of Rs. 30 per meter.

(a) Rs. 1,500
(b) Rs. 1,200
(c) Rs. 3,000
(d) Rs. 2,400

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Q19. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

8 : 67 :: 10 : 103 :: 17 : ?

(a) 312
(b) 292
(c) 145
(d) 192

Q20. The Bishnoi community contributes to forest and animal conservation in _____.

(a) Rajasthan
(b) Gujarat
(c) Madhya Pradesh
(d) Haryana

Q21. If $1 + \sqrt{3}$ and $1 - \sqrt{3}$ are the roots of a quadratic equation, then the quadratic equation is:

(a) $x^2 - 2x - 2 = 0$
(b) $x2 - 2x + 3 = 0$
(c) $x2 - 2x + 2 = 0$
(d) $x2 - 2x - 3 = 0$

Q22. If ΔABC is similar to ΔDEF such that $2AB = DE$ and $BC = 8$ cm, then EF is equal to:

(a) 4 cm
(b) 16 cm
(c) 12 cm
(d) 8 cm

Q23. Mr. Saxena bought some pens at Rs. 150 a dozen. He sold them for Rs. 15 each. What is his profit/loss per cent?

(a) 20% profit
(b) 28.6% loss
(c) 18.5% profit
(d) 37.5% loss

Q24. If '+' means '÷', '-' means '+', '×' means '-' and '÷' means '×', then what will be the value of the following expression?

[{(36 × 16) - (5 ÷ 3)} + (2 - 5)]

(a) 1
(b) 15
(c) 5
(d) 10

Q25. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

3 : 25 :: 7 : 81 :: 11 : ?

(a) 196
(b) 121
(c) 169
(d) 144

Q26. Two express trains of length 320 m and 380 m started moving from Ahmedabad to Delhi at the same time. Their speeds are 84 km/h and 42 km/h, respectively. In how many seconds will the faster train cross the slower train?

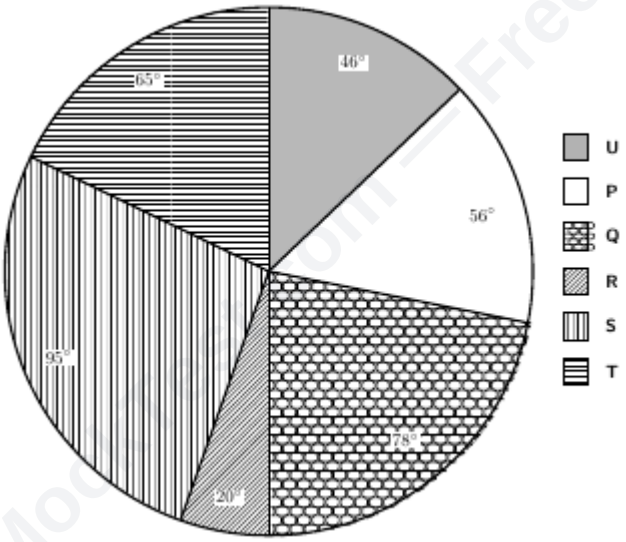
(a) 60 sec
(b) 120 sec
(c) 50 sec
(d) 45 sec

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Q27. In which year was the 11^(th) Fundamental Duty added in the Indian Constitution?

(a) 2002
(b) 1998
(c) 2004
(d) 2012

Q28. The pie chart given below shows the expenditure of a certain company across various sectors - P, Q, R, S, T and U - during a particular year. Study the graph and answer the question.



What approximate percentage of the total spending is spent on sector S?

(a) 24%
(b) 28.3%
(c) 26.4%
(d) 20.05%

Q29. 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.

G _ Q _ A _ T _ N _ G T Q N _ G _ Q N D

(a) T N G Q B Q C
(b) T G G Q B C Q
(c) T N G Q B C T
(d) T A G N B C T

Q30. In chemical reaction N2 + xH2 → 2NH3, what is the value of x?

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

Q31. Find the fourth proportional of x + 7x, x + 5 and x + 6 if x = 3.

(a) 8
(b) 9
(c) 24
(d) 3

Q32. Given below are three statements and three conclusions. Take the statements to be true even if they are at variance with commonly known facts, and decide whether the conclusion/s follow/s the given statements.

Statements:

I. Some monkeys are pandas.

II. Some pandas are giraffes.

III. All giraffes are lions.

Conclusions:

I. Some lions are pandas.

II. Some lions are monkeys.

III. Some giraffes are monkeys.

(a) Only conclusion I follows
(b) Only conclusion III follows
(c) All the conclusions follow
(d) Conclusions I and III follow

Q33. Aerenchyma cells are present in _____.

(a) neem
(b) pea
(c) common water hyacinth
(d) cactus

Q34. If $(a + 1)/a = k$, what is the value of $(a^2 - 1)/(a^2)$?

(a) $k - 2k^2$
(b) $k^2 + 2$
(c) $2k - k^2$
(d) $k + 2$

Q35. $2\ AgCl \rightarrow 2Ag\ (s) + Cl2\ (g)$

What is the suitable condition for the above reaction to take place?

(a) Sunlight
(b) Sunlight + Pressure
(c) Heat + Pressure
(d) Heat

Q36. Two trains start at the same time from Stations A and B respectively and travel towards each other at a speed of 60 km/h and 40 km/h, respectively. At the time they meet, the faster train has travelled 60 km more than the slower train. What is the distance between the two stations?

(a) 300 km
(b) 450 km
(c) 360 km
(d) 420 km

Q37. According to Fleming's right-hand rule, the index finger and the central finger of the right hand represent directions of ____ and ____, respectively.

(a) motion of the conductor, induced current
(b) motion of the conductor, magnetic field
(c) magnetic field and induced current
(d) induced current, magnetic field

Q38. In a row of students facing north, Krish is 19th from the extreme left end while Maya is 30th from the extreme right end. When both of them interchange their positions, Krish becomes 36th from the extreme left end. How many students are there in the row?

(a) 66
(b) 63
(c) 65
(d) 62

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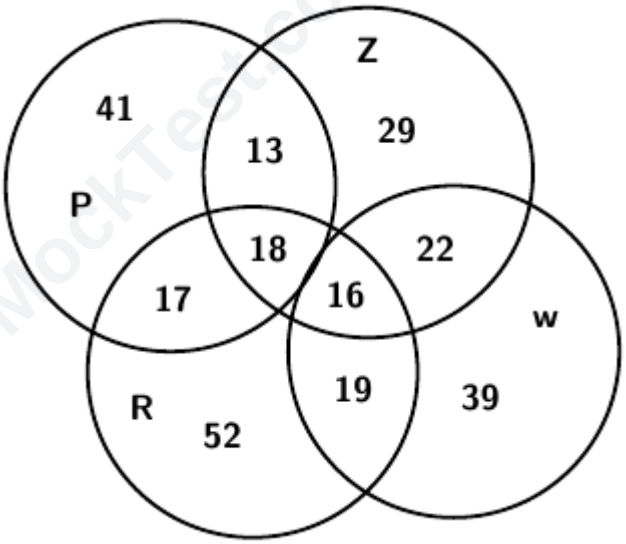
Q39. An electric oven is rated 2500 W. The energy used by it in 5 hours will be:

(a) 12500 kWh
(b) 12.5 kWh
(c) 12500 J
(d) 12.5 J

Q40. The traffic lights at three different crossings turn red after every 30 sec, 45 sec, and 60 sec, respectively. If they all tum red simultaneously at 8.30 a.m., then at what time will they again turn red simultaneously?

(a) 8.33 a.m.
(b) 8.38 a.m.
(c) 8.35 a.m.
(d) 8.34 a.m.

Q41. In the following diagram, R = Students, P = Boys, W = Girls, and Z = Psychology. The number in different sections indicate the number of persons. How many girls are psychology students?



(a) 16
(b) 19
(c) 18
(d) 17

Q42. The value of absolute refractive index of a medium is always:

(a) less than 1
(b) equal to 1
(c) equal to 0
(d) more than 1

Q43. Which regulatory body is the only note issuing authority in India?

(a) Small Industries Development Bank of India.
(b) Insurance Regulatory and Development Authority of India
(c) Reserve Bank of India
(d) Securities and Exchange Board of India

Q44. What temperature will be required for the preparation of Plaster of Paris from gypsum?

(a) 100°C
(b) 373°C
(c) 0°C
(d) 173°C

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Q45. Anuj started to walk from a point A and goes 10 m towards North and then turned left and walked 5 m. He then turned right and walked a distance of 5 m and then again turned right and walked a distance of 5 m before stopping at point P. How far and towards which direction should he walk in order to reach Point A starting from Point P?

(All turns are 90 degree turns only)

(a) 5 m towards East
(b) 10 m towards West
(c) 15 m towards North
(d) 15 m towards South

Q46. In a certain code language, 'DOVE' is written as 'PEFW' and 'CROW' is written as 'SDXP'. How will 'MYNA' be written in that language?

(a) ZNOB
(b) ZNBO
(c) NZOB
(d) ZMBO

Q47. Which of the following environmental factors plays an important role in deciding the sex of a developing organism in some animals?

(a) Humidity
(b) Light
(c) Wind
(d) Temperature

Q48. Today is a Wednesday. What day of the week will it be after 75 days?

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

Q49. Three statements are followed by four conclusions numbered I, II, III and IV. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

1. All parrots are doves.
2. No dove is canary.
3. All flamingoes are canaries.

Conclusions:

I. Some flamingoes are parrots.
II. No canary is parrot.
III. No parrot is flamingo.
IV. Some canaries are parrots.

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

Q50. Where is the respiratory pigment in human body present?

(a) In white blood cells
(b) In red blood cells
(c) In both plasma and white blood cells
(d) In blood plasma

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Q51. A fraction becomes 1/2 if 2 is added to the numerator and 5 is added to the denominator. It also becomes 1/3 if 2 is subtracted from both the numerator and denominator. Then the fraction is

(a) 3/5
(b) 1/7
(c) 8/15
(d) 4/17

Q52. From which year onwards is the Union of India Budget presented on 1 February instead of the last working day of February?

(a) 2015
(b) 2019
(c) 2021
(d) 2017

Q53. Find the area of a regular hexagon (in cm^2) with sides of length 6 cm.

(a) 54 √3
(b) 5 √2
(c) 36
(d) 18

Q54. If a/b = 4/3 and 3a + 2b = 24, then find the value of a.

(a) 5
(b) 13/3
(c) 4
(d) 16/3

Q55. Against which of the following Acts did Mahatma Gandhi decide to launch nationwide Satyagraha in 1919?

(a) Regulating Act
(b) Inland Emigration Act
(c) Pitt's India Act
(d) Rowlatt Act

Q56. The fourth proportion of 12, 24 and 45 is:

(a) 25
(b) 90
(c) 60
(d) 30

Q57. The term 'Panthalassa' is related to which of the following?

(a) Oceans
(b) Atmosphere
(c) Mountains
(d) Soil

Q58. World Wetland Day was celebrated on 2 February 2022. What was theme of this year?

(a) Wetlands and Biodiversity
(b) Wetlands and climate change
(c) Wetland's action for people and nature
(d) Wetlands and water

Q59. Some numbers / markers in this question are coded using the letters according to the table below and the conditions given after it. Your answer is to satisfy those conditions.

Number / sign	@	%	!	4	2	5	#	?	•	=	3	&	7	<

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Code	C	L	N	D	M	B	R	A	P	J	X	W	E	H

Conditions:

If the first element is sign and the last one is a number, these two codes must be interrupted.

If the first element is the odd number and the last one is even number, the first and final elements should be coded as the first.

If both the second and third elements are either numbers or symbols, then the third element will be coded as the code for the second element.

How coded '% + <2 5 ='?

(a) L P H M B J
(b) L H H M B J
(c) L P P M B J
(d) J H P M B L

Q60. The simple interest on a sum of money is 3/5 of the principal in 12 years. What is the rate of interest per annum?

(a) 7%
(b) 8%
(c) 6%
(d) 5%

Q61. A current of 5 A flows through an electrical appliance when the potential difference of 50 V is applied across its terminals. What will be the current drawn by the appliance if the potential difference is increased to 110 V?

(a) 25 A
(b) 5 A
(c) 11 A
(d) 10 A

Q62. The ratio of the present ages of a man and his wife is 7 : 6. After 6 years, this ratio will be 8 : 7. If, at the time of marriage, the ratio of their ages was 4 : 3, then how many years ago from now did they get married?

(a) 15 years
(b) 13 years
(c) 18 years
(d) 16 years

Q63. In which state will you find the Mahendragiri Hills?

(a) Odisha
(b) West Bengal
(c) Jharkhand
(d) Chhattisgarh

Q64. Select the incorrect statements from among the following.

(i) Newland arranged the elements in the order of increasing atomic masses and gave the law of Octaves.

(ii) Sodium is the eighth element after lithium.

(iii) Calcium is the eighth element after Beryllium.

(iv) The law of Octaves was applicable only up to Magnesium, as after Magnesium every eighth element did not possess properties similar to that of the first.

(a) ii
(b) iv
(c) iii, iv
(d) i

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Q65. Simplify: $\sqrt{(1 + \sin\theta)/(1 - \sin\theta)}$.

(a) cosec θ + tan θ
(b) cosec θ - tan θ
(c) sec θ + tan θ
(d) sec θ - tan θ

Q66. If mean of the data 11, 17, x + 1, 3x, 19, 2x - 4, x + 5 is 21, then find the mode of the data.

(a) 15
(b) 19
(c) 11
(d) 17

Q67. Which of the following numbers will replace the question mark (?) in the given series?

6, 8, 13, 23, 40,?

(a) 52
(b) 66
(c) 75
(d) 86

Q68. Based on the given statement, two conclusions are drawn. Find out which conclusion is true based on the statement.

Statement: A < Q, Q < X, E = A < T

Conclusions:

1. T < E
2. A = X

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

Q69. In human males, the sex chromosomes present are XY. What is the difference between them?

(a) There is no difference in size.
(b) Y chromosome has more genes than X chromosome.
(c) X-chromosome is bigger, whereas Y is smaller.
(d) Y chromosome is bigger, whereas X is smaller.

Q70. The sum of roots of the equation $5x^2 - 11x + 6 = 0$ is:

(a) • 6/5
(b) 6/5
(c) 11/5
(d) -11/5

Q71. In which of the following cities did Gautam Buddha get enlightenment?

(a) Lumbini
(b) Sanchi
(c) Kaushambi
(d) Bodh Gaya

Q72. Twelve years ago, Rekha's age was 2/5 of that of her sister. The ratio of Rekha's and her sister's present age is 4 : 7. What is the total of their present ages?

(a) 42 years
(b) 44 years
(c) 66 years
(d) 28 years

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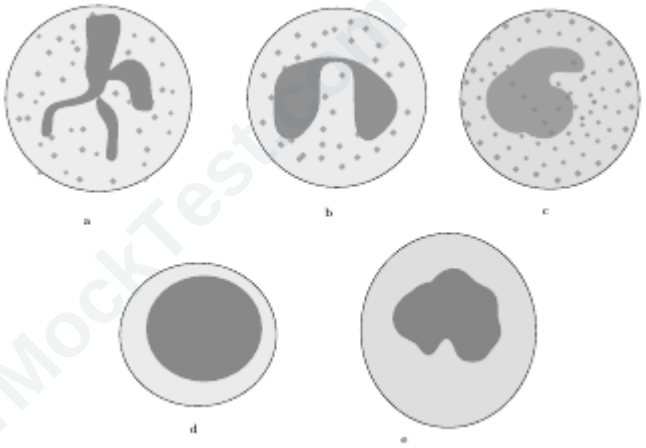
Q73. The cost price of an article is 64% of the marked price. Calculate the gain percent after allowing a discount of 4%.

(a) 60%
(b) 45%
(c) 40%
(d) 50%

Q74. Which among the following States topped the 4^(th) Khelo India Youth Games 2021 medals tally?

(a) Haryana
(b) Rajasthan
(c) Manipur
(d) Karnataka

Q75. The diagram below shows the different types of white blood cells. Identify the option with correct labelling.



(a) a - Eosinophil b - Neutrophil, c - Basophil, d - Monocyte, e - Lymphocyte
(b) a - Neutrophil, b - Basophil, c - Lymphocyte, d - Eosinophil, e - Monocyte
(c) a - Neutrophil, b - Eosinophil, c - Basophil, d - Lymphocyte, e - Monocyte
(d) a - Neutrophil, b - Monocyte, c - Eosinophil, d - Basophil, e - Lymphocyte

Q76. Which of the following numbers will replace the question mark (?) in the given series?

24, 28, 35, 48, 73, ?

(a) 121
(b) 123
(c) 122
(d) 120

Q77. Which of the following salts will give an aqueous solution having pH of almost 7?

(i) NH4Cl
(ii) Na2CO3
(iii) K2SO4

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

Q78. How many such pairs of letters are there in the word 'PARTICLE" (in both forward and backward directions) which have as many letters between them in the word as there are in the English alphabetical order?

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

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Q79. As of July 2022, students from how many minority communities under the Maulana Azad Fellowship Scheme (MANF) get five year fellowships in the form of financial assistance notified by the Central Government, to pursue M. Phil and Ph.D?

(a) Two
(b) Six
(c) Eight
(d) Four

Q80. Six teachers, C, D, E, F, G and H, are sitting around a circular table. They were facing the centre of the table. Exactly two people sit between H and D. while F is sitting to the immediate left of C. E is sitting to the immediate right of H. D is an immediate neighbour of both G and F. Who is the third person to the left of C?

(a) G
(b) H
(c) C
(d) D

Q81. A parallelogram having all sides equal and diagonals unequal is called a:

(a) rectangle
(b) square
(c) kite
(d) rhombus

Q82. Six houses, K, L, M, N, O and P, are located in the same colony. L is 50 m to the south of K. P is 250 m to the west of K. O is 200 m to the north of K. N is 190 m to the south of L. M is 150 m to the east of L. In which direction is House O with reference to House L?

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

Q83. The LCM of $2^3 \times 3^2 \times 5$, $2^2 \times 5^2 \times 7$ and $3^3 \times 5^2 \times 7^2$ is:

(a) $2^3 \times 3^3 \times 5^2 \times 7^2$
(b) $2^3 \times 3^2 \times 5^3 \times 7^2$
(c) $2^3 \times 3^{\wedge}4 \times 5^2 \times 7$
(d) $2^3 \times 3^2 \times 5 \times 7^3$

Q84. Which among the following mirror(s) always forms virtual and erect image?

(A) Convex mirror
(B) Plane mirror
(C) Concave mirror

(a) Only A
(b) Only B
(c) Both A and B
(d) Both B and C

Q85. Six teams named P, Q, R, S, T and U won tournaments in different months of the same year, viz. January, February, March, April, May and June. R won the tournament in January. Q won in the month immediately before U. P won the tournament in the month immediately before S. Exactly two teams won the tournaments between the months of R and S. In which month did T win the tournament?

(a) March
(b) May
(c) April
(d) February

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Q86. Arrange the given fractions in ascending order: 1/3, 4/7, 2/5, 5/6, 3/5

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

Q87. Atal Innovation Mission (AIM) and NITI Aayog in collaboration with _____ launched the community Innovators Fellowship (CIF) marking the 'International Day of Women and Girls in Science'.

(a) Indian Institute of Science
(b) Ministry of Women and Child Development
(c) Department of Science and Technology
(d) United Nations Development Programme (UNDP)

Q88. Six frogs, P, Q, R, S, T and U, were sitting around a circular pond, facing the centre. T was second to the left of S. P was second to the right of U. P is not seated three places to the right of Q. There are exactly two frogs between Q and S. Which frog was sitting to the immediate right of P?

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

Q89. Select the option that has only biodegradable substances.

(a) Eggshells, Paper, Stale biscuits, Fruits, Vegetable peels
(b) Batteries, Vegetable peelings, Stale bread, Glass, Metals
(c) Tetra packs, Metals, Leather, Stale biscuits, Fruits
(d) Glass, Metals, Egg shells, Paper, Tetra packs

Q90. Which new mission has been announced in the Union Budget of India, 2021, for exceptional opportunities in mapping. exploring and utilising the oceanic resources?

(a) Deep Ocean Mission
(b) Samundra Setu Mission
(c) Blue Economy Mission
(d) Maritime Exercise Mission

Q91. A beam of white light undergoes dispersion through a triangular glass prism forming a band of seven colours. Which of the statements is/are correct?

(a) The red-coloured component has minimum refractive index.
(b) The violet-coloured component deviates the least.
(c) All components of white light have same speed in glass.

(a) Only (a)
(b) Only (b)
(c) Both (b) and (c)
(d) Both (a) and (b)

Q92. When is carbon dioxide produced as a waste product in plants?

(a) During respiration
(b) During both respiration and photosynthesis
(c) During photosynthesis
(d) During transpiration

Q93. Which of the following metals can displace aluminium from an aluminium sulphate solution?

(a) Mg
(b) Hg
(c) Fe
(d) Cu

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Q94. On which of the following occasions is 'Natyanjali Utsav' celebrated in Tamil Nadu every year?

(a) Pongal
(b) Janmashtami
(c) Diwali
(d) Mahashivratri

Q95. Based on the given statement, four conclusions are drawn. Find out which conclusion is true based on the statement.

Statement: P = L > K > J < F < N

(a) J = L
(b) K = F
(c) N > K
(d) P > J

Q96. Which microfinance institution of India provides loans only against gold jewellery and provides foreign exchange services, money transfer, wealth management services, travel and tourism services?

(a) Power Finance Corporation Ltd
(b) Muthoot Finance Ltd
(c) Aditya Birla Finance Ltd
(d) Mahindra & Mahindra Financial Services Ltd

Q97. Who is the highest executive officer in the country?

(a) Lok Sabha Speaker
(b) Vice President
(c) The Prime Minister
(d) President

Q98. The following question is based on the given five, 3-digit numbers.

(Left) 721, 463, 227, 316, 627 (Right)

(For example, 456: 6 = digit in unit's place, 5 = digit in ten's place, 4 = digit in hundred's place)

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

If the digit in unit's place of each number is interchanged with the digit in hundred's place of the same number, which original number will become the largest number?

(a) 316
(b) 627
(c) 721
(d) 227

Q99. This question is based on the three-letter words given below:

(Left) CAR HAT FED EYE (Right)

How many letters are there between the second letter of the first word from the left and the first letter of the first word from the right?

(a) 7
(b) 9
(c) 8
(d) 6

Q100. A batsman scored the following runs in the last 5 innings. Find his score in the 4^(th) innings if the average score is 43.

1^(st)	2^(nd)	3^(rd)	4^(th)	5^(th)
92	53	35	x	27

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

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(d) 12

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (b) angel of incidence

The correct answer is angel of incidence.

Key Points

• The acute angle between the incident ray and the principal axis is called the angle of incidence.

• Angle of incidence is the angle between the incident ray and the normal to the surface at the point of incidence.

• Angle of emergence is the angle between the emergent ray and the normal to the surface at the point of emergence.

• Angle of reflection is the angle between the reflected ray and the normal to the surface at the point of incidence.

• Angle of deviation is the angle between the incident ray and the emergent ray.

Additional Information

• A concave mirror is a curved mirror in which the inner side of the curved shape is the reflecting surface.

• Its surface has an inward curvature that makes it resemble the interior surface of a hollow sphere.

• Because concave mirrors enable light beams to converge or come together after reflection, they are also known as converging mirrors.

Q2. Answer: (d) Wednesday

Given: Each of P, Q, R, S, T, U and V has an exam on a different day of a week starting from Monday and ending on Sunday of the same week.

1) V's exam is on Saturday.

2) Q's exam is on Monday.

Day	Person
Monday	Q
Tuesday	
Wednesday	
Thursday	
Friday	
Saturday	V
Sunday	

3) Only two persons have exams between Q and P.

4) Q's exam is immediately before R.

5) Only three persons have exams between R and V.

Day	Person
Monday	Q
Tuesday	R
Wednesday	
Thursday	P
Friday	
Saturday	V
Sunday	

6) Only U's exam is between P and V.

7) T's exam is not held on Wednesday.

Day	Person
Monday	Q
Tuesday	R
Wednesday	
Thursday	P
Friday	U
Saturday	V
Sunday	T

And, exam of S will be held on the remaining day.

Day	Person
Monday	Q
Tuesday	R
Wednesday	S
Thursday	P
Friday	U
Saturday	V
Sunday	T

So, S's exam held on 'Wednesday'.

Hence, the correct answer is "Option 4".

Q3. Answer: (c) PSLV-C52

The correct answer is PSLV-C52.

Key Points

• The Polar Satellite Launch Vehicle (PSLV) is a launch vehicle developed by the Indian Space Research Organisation (ISRO) to launch satellites into orbit.

• PSLV-C52 was used to launch EOS-04, which is an earth observation satellite.

• It is designed to provide images of the earth's surface and atmosphere for applications such as agriculture, forestry, water management, and disaster management.

• PSLV-C51, launched on February 28, 2021, carried Brazil's Amazonia-1 satellite as its primary payload, along with 18 other co-passenger satellites.

• PSLV-C53, launched on April 28, 2021, carried 14 satellites, including India's primary payload, the EMISAT satellite.

• PSLV-C54, launched on August 12, 2021, carried India's Earth observation satellite, EOS-03, along with three other co-passenger satellites.

Additional Information

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• The PSLV has been used for a variety of missions, including launching remote sensing satellites, navigation satellites, and communication satellites.

• The PSLV has been in service since 1993 and has a success rate of 96.6%.

• ISRO has also developed the Geosynchronous Satellite Launch Vehicle (GSLV) for launching heavier satellites into geostationary orbit.

• ISRO is one of the world's leading space agencies and has successfully launched numerous missions, including the Chandrayaan-1 and Mangalyaan missions to the moon and Mars, respectively.

Q4. Answer: (d) 39

Given equation: 21 + 48 - 8 × 6 ÷ 4 = ?

Decoding the given information :

Symbol	•	•	÷	×
Means	•	÷	×	•

Now, replacing the sign from left to right and using BODMAS rule, we get :

New equation: 21 + 48 - 8 × 6 ÷ 4 = ?

Calculation :

=> 21 - 48 ÷ 8 + 6 × 4 = ?

=> 21 - 6 + 6 × 4 = ?

=> 21 - 6 + 24 = ?

=> 45 - 6 = 39.

Hence, the correct answer is "Option 4".

Q5. Answer: (a) AGMPQO

The logic followed here is:

For, NECTAR : TCVEGP

For, POCKET : VGMEQR

Similarly, for 'MONKEY : ?'

Hence, the correct answer is "Option 1".

Q6. Answer: (b) 6

The correct answer is 6.

Key Points

• There are 6 language universities located in India as of June 2022.

• Language universities are institutions that offer specialized courses in various languages and related disciplines, such as linguistics, literature, translation, etc.

• These universities aim to promote the study and research of languages and their cultures, as well as to prepare students for careers in language-related fields.

• It is worth noting that the number of language universities in India may change over time, depending on various factors such as demand, funding, policy changes, etc.

Additional Information

• Three of the six language universities in India are considered to be deemed to be universities.

• Central Universities make up the remaining three.

• The purpose of the Deemed-to-Be Universities is to advance Sanskrit language.

• The three Central Universities are one for the promotion of Hindi, Urdu, and English as Foreign Languages.

Q7. Answer: (a) 0.1 A

The correct answer is 0.1 A.

Key Points

• The induced current in the coil is given by Ohm's law, which states that I = V/R, where V is the induced EMF and R is the resistance of the coil.

• Thus, the induced current in the coil is 5/50 = 0.1 A.

• The direction of the induced current is determined by Lenz's law, which states that the direction of the induced current is such that it opposes the change in magnetic flux that caused it.

• In this case, the time varying magnetic field is inducing an EMF in the coil, so the induced current will flow in a direction that

creates a magnetic field that opposes the original magnetic field.

Additional Information

• A coil of conductor is a device that consists of a series of loops of wire.

• When a magnetic field passes through the coil, it induces an EMF in the coil, which can cause a current to flow if the coil is connected to a circuit.

• The resistance of the coil is a measure of how much the coil resists the flow of current through it.

• It depends on the material of the wire, the length and cross-sectional area of the wire, and the temperature of the wire.

Q8. Answer: (a) 16

Calculation

(2/3 + 1/3) × 23 - 13 + 6

=> 1 × 23 - 13 + 6

=> 29 - 13 = 16

The answer is 16.

Q9. Answer: (d) Noble gas group

The correct answer is Noble gas group.

Key Points

• Noble gas group is a group of elements in the periodic table that includes helium (He), neon (Ne), argon (Ar), krypton (Kr), xenon (Xe), and radon (Rn).

• These elements are characterized by having a full outermost shell of electrons, making them very stable and unreactive.

• This stability is due to the fact that they have achieved a state of equilibrium by filling their outermost shells with electrons.

Additional Information

• Pnictogen group is a group of elements in the periodic table that includes nitrogen (N), phosphorus (P), arsenic (As), antimony (Sb), bismuth (Bi), and moscovium (Mc).

• These elements are characterized by having five valence electrons in their outermost shell.

• Chalcogen group is a group of elements in the periodic table that includes oxygen (O), sulfur (S), selenium (Se), tellurium (Te), and polonium (Po).

• These elements are characterized by having six valence electrons in their outermost shell.

• Halogen group is a group of elements in the periodic table that includes fluorine (F), chlorine (Cl), bromine (Br), iodine (I), and astatine (At).

• These elements are characterized by having seven valence electrons in their outermost shell.

Q10. Answer: (c) Arif Khan

The correct answer is Arif Khan.

Key Points

• India's lone participant in the winter Olympics, who finished 45th in the giant slalom event is Arif Khan.

• He took home two gold medals from the South Asian Winter Games in 2011 in the Alpine skiing events of slalom and giant slalom.

• In the slalom and giant slalom competitions in the 2022 Winter Olympics, he competed on behalf of India.

• He placed 45th in the giant slalom competition and will compete in the slalom on the 16th.

Additional Information

• Himanshu Thakur is an Indian alpine skier.

• In the giant slalom competition, he represented India at the 2014 Winter Olympics, placing 72nd overall.

• In February 2017, Thakur was selected for India's squad for the 2017 Asian Winter Games.

• Aanchal Thakur is the first Indian to win an international medal in skiing.

• She won a bronze medal in the Alpine Ejder 3200 Cup held in Turkey in January 2018.

Q11. Answer: (a) CH3COOH

The correct answer is CH3COOH.

Key Points

• The given reaction is an example of an oxidation reaction where an aldehyde is oxidized to a carboxylic acid.

• The reagent used in this reaction is KMnO4(potassium permanganate) which acts as an oxidizing agent.

• CH3CHO is the product formed when the aldehyde group (-CHO) in the reactant is oxidized to a carboxylic acid group (-COOH).

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Additional Information

• Potassium permanganate (KMnO4) is a strong oxidizing agent commonly used in organic chemistry for the oxidation of alcohols and aldehydes to carboxylic acids.

• CH3COOH is acetic acid which is a carboxylic acid and can be formed from the oxidation of an alcohol.

• CH3COOCH3 is methyl acetate which is an ester and can be formed from the reaction of acetic acid with methanol.

• CH2=CH2 is ethene which is an alkene and can be formed from the dehydrogenation of ethanol.

Q12. Answer: (b) 1966

The correct answer is 1966.

Key Points

• The Indira Gandhi Government devalued the India Rupee in 1966.

• Devaluation refers to the reduction in the value of a currency in relation to other currencies.

• The decision to devalue the Rupee was made to address the balance of payments crisis in India at that time.

• The devaluation was aimed at making Indian exports cheaper and more competitive in the global market.

Additional Information

• The balance of payments crisis in India in the mid-1960s was caused by a combination of factors, including a large trade deficit, a decline in foreign aid and investment, and a rise in oil prices.

• The devaluation of the Rupee in 1966 was the first major devaluation since India gained independence in 1947.

• The devaluation in 1978 was done as a part of a broader strategy to boost exports and reduce imports.

• The devaluation in 1970 was done to address the issue of overvaluation of the Rupee.

Q13. Answer: (c) 1726

The correct answer is 1726.

Key Points

• The Municipal Corporation in Calcutta was established by a royal charter granted by King George I in the year 1726.

• The corporation was responsible for the administration of the city of Calcutta, which was then the capital of British India.

• The Calcutta Municipal Corporation was the first municipal corporation to be set up in India.

Additional Information

• The municipal government of Kolkata, the state capital of West Bengal, is known as the Kolkata Municipal Corporation (KMC).

• This civic administrative entity is responsible for 206.08 square kilometers of territory.

• Its insignia bears the Bengali script slogan, Purosri Bibardhan.

Q14. Answer: (b) 8

Given equation: 24 - 3 × 12 + 4 ÷ 3 = ?

Decoding the given information :

Symbol	•	•	÷	×
Means	•	÷	×	•

Now, replacing the sign from left to right and using BODMAS rule, we get :

New equation: 24 - 3 × 12 + 4 ÷ 3 = ?

Calculation :

=> 24 ÷ 3 + 12 - 4 × 3 = ?

=> 8 + 12 - 4 × 3 = ?

=> 8 - 12 + 12 = ?

=> 20 - 12 = 8.

Hence, the correct answer is "Option 2".

Q15. Answer: (d) Copper

The correct answer is Copper.

Key Points

• Copper is a metal with high conductivity and low resistance, which makes it the most preferred material for electrical transmission lines.

• It is also used in electrical wiring, motors, transformers, and other electrical applications.

• Copper is a good conductor of heat and has high corrosion resistance, making it a durable material for long-term use.

Additional Information

• Nichrome is an alloy of nickel and chromium, which is known for its high electrical resistance.

• It is commonly used in heating elements, but not preferred for electrical transmission lines due to its high resistance.

• Nichrome wires are used in applications where heat resistance is required, such as in toasters, hair dryers, and ovens.

• Tungsten is a metal with the highest melting point and highest tensile strength of all metals.

• It is commonly used in filaments for incandescent light bulbs, but not preferred for electrical transmission lines due to its high cost and low conductivity.

• Tungsten wires are used in applications where high temperature resistance is required, such as in welding electrodes and rocket nozzles.

• Tin-lead alloy is a mixture of tin and lead, which is commonly used as a solder for electronic components.

• It is not preferred for electrical transmission lines due to its low conductivity and toxicity of lead.

• Tin-lead alloys are used in applications where low melting point and good wetting properties are required, such as in electronic circuit boards.

Q16. Answer: (d) Both arguments I and II weaken the statement

The correct answer is Both arguments I and II weaken the statement.

Key Points

• The statement mentions that private schools have increased their fees by 20% due to rising costs.

• Let's evaluate the given arguments in light of this statement.

• Argument I: The government has lowered the taxes levied on private schools by 8% this year.

• This argument does not directly relate to the statement.

• Even if the taxes have been lowered, it does not necessarily mean that private schools cannot increase their fees.

• Hence, argument I weakens the statement.

• Argument II: The Teacher's Union is protesting against the decision of private schools to cut salaries by 15%.

• This argument also does not directly relate to the statement.

• It talks about private schools cutting salaries, which is not mentioned in the statement.

• Hence, argument II weakens the statement.

• Therefore, both arguments I and II weaken the statement.

Additional Information

• Private schools are educational institutions that are not run by the government but are owned and managed by private individuals or organizations.

• Instead of depending on taxes for public (government) funding, private schools maintain the autonomy to choose their students and are entirely or partially supported by the tuition fees paid by their students.

• Certain religious denominations or faiths, such Roman Catholicism, different branches of Protestantism, or Judaism, are linked to certain private schools.

Q17. Answer: (c) Only 2014 and 2015

Concept used

Average

Calculation

Total sale = 2.6 + 1.2 + 5.5 + 4.2 + 6.3 + 5.4 = 25.2

Average = 25.2/6 = 4.2

The sale is below the average only in 2014 and 2015.

Q18. Answer: (a) Rs. 1,500

Shortcut Trick

Area = 100 m^2, Side 1 = 20 m

Side 2 = 100 ÷ 20 = 5 m

Perimeter = 2 × (20 + 5) = 50 m

Total Cost = 50 × 30 = Rs. 1,500

Therefore The correct answer is Rs. 1,500.

Alternate Method

Given:

Area of rectangular land = 100 m^2

Length (l) = 20 m

Rate of fencing = Rs. 30 per meter

Formula Used:

Area = Length × Breadth

Perimeter = 2 × (Length + Breadth)

Total Cost = Perimeter × Rate

Calculations:

=> 100 = 20 × Breadth (b)

=> Breadth (b) = 100 ÷ 20 = 5 m

=> Perimeter = 2 × (20 + 5)

=> Perimeter = 2 × 25 = 50 m

=> Total Cost = 50 × 30

=> Total Cost = Rs. 1,500

Therefore The correct answer is Rs. 1,500.

Additional Information

Diagonal of a Rectangle

The distance between opposite corners is given by $d = \sqrt{(l^2 + b^2)}$.

Cost of Leveling

Leveling is done on the Area, so Total Cost = Area × Rate per sq. unit.

Fencing for Square

For a square land with side 'a', the perimeter is 4a and the area is a^2.

Q19. Answer: (b) 292

The logic followed here is:

Logic: (1st number)² + 3 = 2nd number.

Now,

For, 8 : 67

→ $(8)^2 + 3$

→ 64 + 3 = 67.

For, 10 : 103

→ (10)2 + 3

→ 100 + 3 = 103.

Similarly, for 17 : ?

→ (17)2 + 3

→ 289 + 3 = 292.

Hence, the correct answer is "Option 2".

Q20. Answer: (a) Rajasthan

The correct answer is Rajasthan.

Key Points

• The Bishnoi community is known for their beliefs in protecting the environment and wildlife in Rajasthan.

• They follow the principle of "Jeev Daya" which means compassion towards all living beings.

• The community has a long history of conservation efforts, dating back to the 15th century, when their founder Guru Jambheshwar preached about the importance of protecting nature.

Additional Information

• In Rajasthan, the Bishnoi community has played a significant role in protecting the Khejri trees, which are considered sacred by them and are also essential for the ecosystem.

• They also protect the blackbuck antelope, which is a symbol of their community, and have even sacrificed their lives to protect them from hunters.

• Apart from Rajasthan, the Bishnoi community is also present in parts of Haryana, Punjab, Gujarat, and Madhya Pradesh, where they continue to contribute to conservation efforts.

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Q21. Answer: (a) $x^2 - 2x - 2 = 0$

Shortcut Trick

Sum of roots (S) = $(1 + \sqrt{3}) + (1 - \sqrt{3}) = 2$.

Product of roots (P) = $(1 + \sqrt{3}) \times (1 - \sqrt{3}) = 1^2 - (\sqrt{3})^2 = 1 - 3 = -2$.

The quadratic equation is given by $x^2 - (\text{Sum})x + (\text{Product}) = 0$.

Substituting the values: $x^2 - 2x + (-2) = 0 \Rightarrow x^2 - 2x - 2 = 0$.

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

Alternate Method

Given roots of the quadratic equation: $\alpha = 1 + \sqrt{3}$ and $\beta = 1 - \sqrt{3}$.

Formula: $x^2 - (\text{Sum of roots})x + (\text{Product of roots}) = 0$

=> Sum of roots $(\alpha + \beta) = (1 + \sqrt{3}) + (1 - \sqrt{3})$

=> Sum of roots $= 1 + 1 + \sqrt{3} - \sqrt{3} = 2$

=> Product of roots $(\alpha \times \beta) = (1 + \sqrt{3})(1 - \sqrt{3})$

=> Product of roots $= (1)^2 - (\sqrt{3})^2$ [Using identity $(a + b)(a - b) = a^2 - b^2$]

=> Product of roots $= 1 - 3 = -2$

=> Required Equation: $x^2 - (2)x + (-2) = 0$

=> $x^2 - 2x - 2 = 0$

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

Additional Information

Nature of Roots

For a quadratic equation $ax^2 + bx + c = 0$, the nature of roots depends on the discriminant $D = b^2 - 4ac$. If $D > 0$ and not a perfect square, the roots are irrational and conjugate pairs.

Irrational Conjugate Roots

If one root of a quadratic equation with rational coefficients is $p + \sqrt{q}$, then the other root must be $p - \sqrt{q}$.

Relation between Coefficients and Roots

If α and β are the roots, then the sum of roots is $-b/a$ and the product of roots is c/a.

Q22. Answer: (b) 16 cm

Shortcut Trick

When two triangles are similar, the ratio of their corresponding sides is equal.

Given $\Delta ABC \sim \Delta DEF$ and $2AB = DE \Rightarrow DE/AB = 2$.

The scale factor from ΔABC to ΔDEF is 2.

Therefore $EF = 2 \times BC = 2 \times 8 = 16$ cm.

Therefore The correct answer is 16 cm.

Alternate Method

Given:

$\Delta ABC \sim \Delta DEF$

$2AB = DE \Rightarrow AB/DE = 1/2$

$BC = 8$ cm

Formula Used:

If two triangles are similar, the ratio of their corresponding sides is equal:

$AB/DE = BC/EF = AC/DF$

A

B

C

D

E

F

AB

DE = 2AB

BC = 8 cm

EF = ?

ΔABC ~ ΔDEF → Scale Factor = 2

Calculations:

=> AB/DE = BC/EF

=> 1/2 = 8 / EF

=> EF = 8 × 2

=> EF = 16 cm

Therefore The correct answer is 16 cm.

Additional Information

Similarity of Triangles

Two triangles are similar if their corresponding angles are equal and corresponding sides are proportional. ΔABC ~ ΔDEF => AB/DE = BC/EF = AC/DF.

Area of Similar Triangles

The ratio of the areas of two similar triangles is equal to the square of the ratio of their corresponding sides: Area(ΔABC) / Area(ΔDEF) = $(AB/DE)^2$.

Perimeter of Similar Triangles

The ratio of the perimeters of two similar triangles is equal to the ratio of their corresponding sides: Perimeter(ΔABC) / Perimeter(ΔDEF) = AB/DE.

Q23. Answer: (a) 20% profit

Shortcut Trick

Convert dozen to individual units: 1 dozen = 12 units.

Cost Price (CP) of 12 pens = Rs. 150.

Selling Price (SP) of 12 pens = 15 × 12 = Rs. 180.

Profit = 180 − 150 = Rs. 30.

Profit% = (30 ÷ 150) × 100 = 20%.

Therefore The correct answer is 20% profit.

Alternate Method

Given: CP of 1 dozen = Rs. 150, SP of 1 pen = Rs. 15.

Formulas: CP per unit = Total CP ÷ Quantity | Profit = SP − CP | Profit% = (Profit ÷ CP) × 100

=> CP of 1 pen = 150 ÷ 12 = Rs. 12.50.

=> SP of 1 pen = Rs. 15.

=> Profit per pen = 15 − 12.50 = Rs. 2.50.

=> Profit% = (2.50 ÷ 12.50) × 100 = 20%.

Therefore The correct answer is 20% profit.

Additional Information

Unitary Method

Always ensure both Cost Price and Selling Price are calculated for the same number of articles before finding profit or loss percentage.

Profit and Loss Basics

If SP > CP, it is a Profit. If CP > SP, it is a Loss. Percentages are always calculated on the Cost Price (CP) unless stated otherwise.

Q24. Answer: (c) 5

Given equation: [{(36 × 16) - (5 ÷ 3)} + (2 - 5)]

Decoding the given information :

Symbol	•	•	×	÷
Means	÷	•	•	×

Now, replacing the sign from left to right and using BODMAS rule, we get :

New equation: [{(36 × 16) - (5 ÷ 3)} + (2 - 5)]

Calculation :

=> [{(36 - 16) + (5 × 3)} ÷ (2 + 5)]

=> [{(36 - 16) + 15)} ÷ (2 + 5)]

=> [{20 + 15)} ÷ (2 + 5)]
=> [35 ÷ (2 + 5)]
=> 35 ÷ 7 = 5.
Hence, the correct answer is "Option 3".

Q25. Answer: (c) 169

The logic followed here is:
Logic: (1st number + 2)² = 2nd number.
Now,
For, 3 : 25
→ (3 + 2)²
→ 5² = 25.
For, 7 : 81
→ (7 + 2)2
→ 92 = 81.
Similarly, for 11 : ?
→ (11 + 2)2
→ 132 = 169.
Hence, the correct answer is "Option 3".

Q26. Answer: (a) 60 sec

Shortcut Trick
Total distance to cover = Sum of lengths of both trains = 320 + 380 = 700 m.
Relative speed (same direction) = Difference of speeds = 84 − 42 = 42 km/h.
Relative speed in m/s = 42 × (5/18) = 35/3 m/s.
Time taken = Distance ÷ Relative Speed = 700 ÷ (35/3) = 20 × 3 = 60 sec.
Therefore The correct answer is 60 sec.
Alternate Method
Given:
Length of first train (L1) = 320 m
Length of second train (L2) = 380 m
Speed of first train (S1) = 84 km/h
Speed of second train (S2) = 42 km/h
Formula Used:
Relative Speed (Same direction) = S1 − S2
Time = (L1 + L2) ÷ Relative Speed
Conversion: 1 km/h = 5/18 m/s
Calculations:
=> Total distance = 320 + 380 = 700 m
=> Relative speed = 84 − 42 = 42 km/h
=> Relative speed in m/s = 42 × 5/18 = 7 × 5/3 = 35/3 m/s
=> Time taken = 700 ÷ (35/3)
=> Time taken = (700 × 3) ÷ 35
=> Time taken = 20 × 3 = 60 seconds
Therefore The correct answer is 60 sec.
Additional Information
Relative Speed in Opposite Direction
When two objects move towards each other, their relative speed is the sum of their individual speeds (S1 + S2).
Train Crossing a Pole or Point Object
The distance covered to cross a pole or stationary person is equal to the length of the train itself.
Unit Conversion Shortcut
To convert km/h to m/s, multiply by 5/18. To convert m/s to km/h, multiply by 18/5.

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Q27. Answer: (a) 2002

The correct answer is 2002.

Key Points

• Fundamental Duties were added to the Constitution of India through the 42nd Amendment Act, 1976.

• The 11th Fundamental Duty was added to the Indian Constitution in 2002.

• The 11th Fundamental Duty of Indian citizens is to provide educational opportunities to children between the ages of 6 and 14, and to ensure that parents provide these opportunities to their children.

• The inclusion of Fundamental Duties was inspired by the Constitution of the former USSR and aims to promote a sense of patriotism and civic responsibility among citizens.

Additional Information

• Fundamental Duties were recommended by the Swaran Singh Committee in 1976, and their importance became apparent during the internal emergency of 1975–1977.

• Ten Fundamental Duties were added to the Indian Constitution by the 42nd Amendment Act of 1976.

• Later, the 11th Fundamental Duty was added to the list by the 86th Amendment Act of 2002.

• In Article 51A of Part IV A of the Indian Constitution, the Fundamental Duties are addressed.

• Indian Fundamental Duties include maintaining public property, honoring our flag, listening to the national song with reverence, and abiding by the Indian Constitution.

Q28. Answer: (c) 26.4%

Calculation

The total spending is spent on sector S = 95°

360° → 100%

95° → 100/360 × 95 = 26.38% ≈ 26.40%

The answer is 26.40%

Q29. Answer: (c) T N G Q B C T

The logic followed here is:

Given Sequence: G _ Q _ A _ T _ N _ G T Q N _ G _ Q N D

Now, putting the letters in the blank spaces given in the option one by one:

Option 1) T N G Q B Q C → G T Q N A / G T Q N B / G T Q N Q / G C Q N D

Option 2) T G G Q B C Q → G T Q G A / G T Q N B / G T Q N C / G Q Q N D

Option 3) T N G Q B C T → G T Q N A / G T Q N B / G T Q N C / G T Q N D

Here, the last letter is increasing by +1 and it's followed a pattern.

Option 4) T A G N B C T → G T Q A A / G T N N B / G T Q N C / G T Q N D

Hence, the correct answer is "Option 3".

Q30. Answer: (c) 3

The correct answer is 3.

Key Points

• The chemical equation N2 + xH2 → 2NH3 represents the reaction between nitrogen and hydrogen to form ammonia.

• The balanced equation states that two molecules of ammonia are formed for every one molecule of nitrogen and three molecules of hydrogen.

• Therefore, the value of x represents the number of hydrogen molecules required to react with one molecule of nitrogen.

• By comparing the number of hydrogen atoms on each side of the equation, it can be determined that x = 3.

• This is because there are six hydrogen atoms on the product side (2NH3) and only two hydrogen atoms on the reactant side (xH2).

Additional Information

• Nitrogen fixation is the process of converting atmospheric nitrogen into a usable form by living organisms.

• This reaction is an example of nitrogen fixation, as ammonia can be used by plants as a source of nitrogen for growth.

• The Haber-Bosch process is an industrial method used to produce ammonia on a large scale.

• It involves the reaction of nitrogen and hydrogen under high pressure and temperature, using a catalyst.

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Q31. Answer: (d) 3

Shortcut Trick

Given x = 3, substitute directly into the expressions.

The numbers are: (3^2 + 7×3) = 30, (3 + 5) = 8, and (3 + 6) = 9.

Fourth proportional d = (b × c) ÷ a.

d = (8 × 9) ÷ 30 = 72 ÷ 30 = 2.4.

Wait, checking calculations: x^2+7x = 9+21=30; x+5=8; x+6=9. Fourth proportional = (8×9)/30 = 2.4. Let us re-read the first term: x + 7x as given in the prompt.

If first term is x + 7x: 3 + 21 = 24. Then d = (8 × 9) ÷ 24 = 72 ÷ 24 = 3.

Therefore The correct answer is 3.

Alternate Method

Given: x = 3. Expressions: x + 7x, x + 5, x + 6.

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

=> First term (a) = x + 7x = 3 + 7(3) = 3 + 21 = 24

=> Second term (b) = x + 5 = 3 + 5 = 8

=> Third term (c) = x + 6 = 3 + 6 = 9

=> Let the fourth proportional be d.

=> 24 ÷ 8 = 9 ÷ d

=> 3 = 9 ÷ d

=> d = 9 ÷ 3 = 3

Therefore The correct answer is 3.

Additional Information

Mean Proportional

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

Third Proportional

The third proportional of two numbers a and b is such that a, b, c are in continued proportion, where c = b^2 ÷ a.

Compounded Ratio

The compounded ratio of (a : b) and (c : d) is (ac : bd).

Q32. Answer: (a) Only conclusion I follows

Given Statements:

I. Some monkeys are pandas.

II. Some pandas are giraffes.

III. All giraffes are lions.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some lions are pandas - True (Because, Those part of lions which is giraffes will pandas also).

II. Some lions are monkeys - False (Because, No definite relation given between lions and monkeys, so it can be possible only).

III. Some giraffes are monkeys - False (Because, No definite relation given between giraffes and monkeys, so it can be possible only).

So, Only conclusion I follows.

Hence, the correct answer is "Option 1".

Q33. Answer: (c) common water hyacinth

The correct answer is common water hyacinth.

Key Points

• Aerenchyma cells are specialized cells that have large air spaces in them, which allows for gas exchange and buoyancy in aquatic plants.

• These cells are present in the common water hyacinth, which is a floating aquatic plant that can be found in many freshwater ecosystems.

• Aerenchyma is especially in the stem of the hyacinth.

• The stem part becomes buoyant and due to this, the water hyacinth floats on the surface of the water.

Additional Information

• Neem is a tree species that is native to the Indian subcontinent and is widely used in traditional medicine and agriculture.

• Neem does not typically have aerenchyma cells, as it is not an aquatic plant.

• Pea is a common garden plant that is a member of the legume family and is often used as a source of protein in human and animal diets.

• Pea plants do not have aerenchyma cells either, as they are not adapted to living in water.

• Cactus is a group of plants that are adapted to living in arid environments and have specialized water storage structures and spines to protect against herbivores.

• Cactus plants also do not have aerenchyma cells, as they are adapted to living in dry environments and do not need to exchange gases in the same way that aquatic plants do.

Q34. Answer: (c) 2k - k²

Shortcut Trick

Split the given expression: (a + 1)/a = 1 + 1/a = k => 1/a = k − 1.

Split the target expression: (a² − 1)/a² = 1 − (1/a)².

Substitute 1/a: 1 − (k − 1)² = 1 − (k² − 2k + 1).

On simplifying: 1 − k² + 2k − 1 = 2k − k².

Therefore The correct answer is 2k - k².

Alternate Method

Given: (a + 1)/a = k

Formula Used: (x − y)² = x² − 2xy + y²

Calculations:

=> (a + 1)/a = k

=> a/a + 1/a = k

=> 1 + 1/a = k

=> 1/a = k − 1

Now, evaluate the required expression:

=> (a² − 1)/a² = a²/a² − 1/a²

=> 1 − (1/a)²

Substituting the value of 1/a = (k − 1):

=> 1 − (k − 1)²

=> 1 − [k² − 2(k)(1) + 1²]

=> 1 − [k² − 2k + 1]

=> 1 − k² + 2k − 1

=> 2k − k²

Therefore The correct answer is 2k - k².

Additional Information

Algebraic Identities

The expansion (x − y)² = x² − 2xy + y² is fundamental for simplifying expressions involving squares of differences.

Reciprocal Relations

Equations in the form (x + 1)/x = k can be simplified to 1 + 1/x = k, allowing for easy substitution of the reciprocal term 1/x.

Difference of Squares

The identity x² − y² = (x − y)(x + y) is another way to factorize the numerator before division.

Q35. Answer: (a) Sunlight

The correct answer is Sunlight.

Key Points

• The given reaction is a photochemical reaction, which means it requires light energy to proceed.

• Sunlight provides the necessary energy to break the bond between Ag and Cl atoms in AgCl.

• This reaction is an example of a decomposition reaction, where a single compound breaks down into two or more simpler substances.

• The Cl2 gas produced in this reaction is highly reactive and can be used for various industrial purposes.

Additional Information

• Sunlight refers to the energy provided by the sun in the form of light.

• Sunlight is essential for the survival of all living organisms on Earth and is also used as a source of energy in various applications.

• The bonds that hold the atoms of the initial substance together break down during a decomposition reaction.

• After that, the atoms rearrange to create new bonds, creating new substances with characteristics distinct from the original component.

• Metal extraction from their ores is a significant use of decomposition processes.

Q36. Answer: (a) 300 km

Shortcut Trick

In the same time, the ratio of distances is equal to the ratio of speeds.

Ratio of speeds = 60 : 40 = 3 : 2

Difference in distance ratio = 3 − 2 = 1 unit

Given 1 unit = 60 km

Total distance ratio = 3 + 2 = 5 units => 5 × 60 = 300 km

Therefore The correct answer is 300 km.

Alternate Method

Given:

Speed of Train 1 (v1) = 60 km/h

Speed of Train 2 (v2) = 40 km/h

Difference in distance covered = 60 km

Formula:

Time (t) = Difference in Distance ÷ Difference in Speed

Calculations:

=> Difference in speed = 60 − 40 = 20 km/h

=> Time taken to meet (t) = 60 ÷ 20 = 3 hours

=> Distance traveled by Train 1 = 60 × 3 = 180 km

=> Distance traveled by Train 2 = 40 × 3 = 120 km

=> Total distance between A and B = 180 + 120 = 300 km

Therefore The correct answer is 300 km.

Additional Information

Relative Speed Concept

When two objects move towards each other (opposite direction), relative speed = S1 + S2. When they move in the same direction, relative speed = |S1 − S2|.

Meeting Time Formula

Time taken to meet = Initial distance between objects ÷ Relative speed. In this problem, Total Distance = (S1 + S2) × t.

Constant Time Property

If time is constant, the distance covered is directly proportional to the speed (D1/D2 = S1/S2).

Q37. Answer: (c) magnetic field and induced current

• According to Fleming's right-hand rule, the forefinger is pointed in the direction of Magnetic Field.

• The thumb is pointed in the direction of the motion of the conductor related to the Magnetic Field while the second finger represents the direction of the induced or generated current.

• Fleming's Right-hand Rule gives the direction of induced current when a conductor moves inside a Magnetic Field.

Q38. Answer: (c) 65

The logic followed here is:

Position of Krish from the left = 19th

Position of Maya from the right = 30th

After interchanging, Position of Krish from the right = 36th

So,

Total number of people = Position of Maya from the right + Position of Krish from the right after interchange - 1

= 30 + 36 - 1

= 66 - 1 = 65.

Hence, the correct answer is "Option 3".

Q39. Answer: (b) 12.5 kWh

The correct answer is 12.5 kWh.

Key Points

• The unit of energy is measured in kWh (kilowatt-hour), which is the amount of energy consumed by a 1000 W device in one hour.

• The electric oven is rated at 2500 W, which means it consumes 2.5 kWh of energy in one hour.

• To calculate the energy used by the oven in 5 hours, we need to multiply the power rating by the time duration: 2500 W x 5 hours = 12,500 Wh.

• Since 1 kWh = 1000 Wh, we need to convert the energy from watt-hours to kilowatt-hours: 12,500 Wh x 1000 = 12.5 kWh.

• Therefore, the energy used by the electric oven in 5 hours is 12.5 kWh.

Additional Information

• Kilowatt hours (kWh) are the unit of measurement for energy consumption, which is the entire amount of energy used for a specific process.

• This covers the usage of fuels such as oil, gas, diesel, electricity, and biomass.

• E = P × (t/1000) is the formula for energy consumption, where P is the power unit in watts, t is the amount of time that the power or energy was consumed, and E is the energy measured in Joules or kilowatt-hours (kWh).

Q40. Answer: (a) 8.33 a.m.

Shortcut Trick

To find the next simultaneous occurrence, calculate the LCM of the given intervals.

LCM of 30, 45, and 60 = 180 seconds.

Convert 180 seconds to minutes: 180 ÷ 60 = 3 minutes.

Next simultaneous red light = 8:30 a.m. + 3 minutes = 8:33 a.m.

Therefore The correct answer is 8:33 a.m.

Alternate Method

Given: Intervals are 30 sec, 45 sec, and 60 sec. Initial time is 8:30 a.m.

Formula: Time for next simultaneous event = Initial Time + LCM(intervals).

Step-by-step calculations:

=> 30 = $2 \times 3 \times 5$

=> 45 = $3^2 \times 5$

=> 60 = $2^2 \times 3 \times 5$

=> LCM = $2^2 \times 3^2 \times 5 = 4 \times 9 \times 5 = 180$

=> Time interval in minutes = 180 ÷ 60 = 3 minutes

=> New time = 8:30 a.m. + 0:03 = 8:33 a.m.

Therefore The correct answer is 8:33 a.m.

Additional Information

LCM (Least Common Multiple)

The smallest positive integer that is divisible by each of the given numbers. Used for periodic events like bells ringing or lights flashing.

Time Conversion Units

1 minute = 60 seconds and 1 hour = 60 minutes. Always ensure units are consistent before adding to the clock time.

Prime Factorization Method

LCM can be found by taking the highest power of all prime factors present in the numbers: LCM = Product of highest powers of primes.

Q41. Answer: (a) 16

According to the given Venn diagram:

R = Students, P = Boys, W = Girls, and Z = Psychology.

The shaded area shows "the girls who are psychology students?".

So, there are 16 girls who are psychology students.

Hence, the correct answer is "Option 1".

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Q42. Answer: (d) more than 1

The correct answer is more than 1.

Key Points

• Refractive index is a measure of how much a ray of light bends when it passes through a medium.

• Absolute refractive index is the ratio of the speed of light in a vacuum to the speed of light in the medium.

• The value of absolute refractive index of a medium is always more than 1.

Additional Information

• The characteristics of a medium affect the speed of light within it.

• The optical density of the medium affects the speed of electromagnetic waves.

• The atoms' propensity to replenish the electromagnetic energy they have received is known as optical density.

• The speed of light decreases with increasing optical density.

• The refractive index is one such measure of a medium's optical density.

• The refractive index of a medium depends on the density and composition of the medium.

• When the refractive index of a medium is more than 1, it means that the speed of light is slower in that medium than in a vacuum.

Q43. Answer: (c) Reserve Bank of India

The correct answer is Reserve Bank of India.

Key Points

• Reserve Bank of India (RBI) is the central bank of India and was established on April 1, 1935.

• It is responsible for regulating the monetary policy of India, managing the country's foreign exchange reserves, and issuing currency notes and coins.

• The RBI also acts as a banker to the government and other commercial banks in India.

Additional Information

• Small Industries Development Bank of India (SIDBI) is a financial institution established in 1990.

• It was made with the aim of promoting and developing small-scale industries in India.

• Insurance Regulatory and Development Authority of India (IRDAI) is a regulatory body that oversees the insurance sector in India.

• It operated under Ministry of Finance, Government of India.

• Securities and Exchange Board of India (SEBI) is a regulatory body that oversees the securities market in India.

• The chairperson of SEBI is Madhabi Puri Buch.

• She is SEBI's first female chairperson.

Q44. Answer: (a) 100°C

The correct answer is 100°C.

Key Points

• Plaster of Paris is a white powder obtained by heating gypsum at a temperature of 100-150^oC.

• When gypsum is heated to this temperature, it loses about three-quarters of its water of crystallization and forms a fine powder known as Plaster of Paris.

• This powder can be mixed with water to form a paste, which can be used to cast molds, sculptures, and other decorative objects.

• The setting time of Plaster of Paris is relatively short, making it an ideal material for casting small objects.

Additional Information

• The quantity of water molecules that combines chemically in a specific molecular proportion with the relevant salt in a crystalline state is known as the water of crystallization.

• The crystals' geometric form and color are the result of this water.

• It is a crystal structure made of water bound together chemically.

Q45. Answer: (d) 15 m towards South

Given:

Anuj started to walk from a point A and goes 10 m towards North,

And then turned left and walked 5 m.

He then turned right and walked a distance of 5 m,

And then again turned right and walked a distance of 5 m before stopping at point P.

So, Point A is '15 m towards South' from Point P.

Hence, the correct answer is "Option 4".

Q46. Answer: (b) ZNBO

The logic followed here is:

'DOVE' is written as 'PEFW'

'CROW' is written as 'SDXP'

Similarly, for MYNA:

'MYNA' will be written as 'ZNBO'

Hence, the correct answer is "Option 2".

Q47. Answer: (d) Temperature

The correct answer is Temperature.

Key Points

• In some animals, the sex of a developing organism is determined by the temperature at which the eggs are incubated.

• This phenomenon is known as temperature-dependent sex determination (TSD).

• In TSD, the sex of the offspring is determined by the temperature experienced during a critical period of embryonic development.

• This critical period is different for different species.

Additional Information

• In some species, such as turtles and crocodiles, warmer temperatures during incubation result in the development of more females, while cooler temperatures result in more males.

• In other species, such as some lizards, the opposite is true.

• TSD is an adaptive mechanism that allows species to adjust the sex ratio of their offspring to match the prevailing environmental conditions.

• However, it also makes them vulnerable to climate change, as even small changes in temperature can have significant effects on the sex ratio of their offspring.

Q48. Answer: (c) Monday

Given: Today is Wednesday.

Now, after 75 days from today.

As, we know 7 days = 1 week.

So, 75 days = 75/7 = 10 week and 5 odd days.

Then,

After 75 days from today will be Wednesday + 5 = Monday.

Hence, the correct answer is "Option 3".

Q49. Answer: (d) Only conclusions II and III follow.

Given Statements:

1. All parrots are doves.

2. No dove is canary.

3. All flamingoes are canaries.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some flamingoes are parrots - False (Because, no definite relation given between flamingoes and parrots, so it can be possible only).

II. No canary is parrot - True (Because, All parrots are Doves, and no Doves is canary, it gives no canary is parrot).

III. No parrot is flamingo - True (Because, All parrots are Doves, and no Doves is canary, and all the flamingoes are canary, so no parrot will be the part of flamingo).

IV. Some canaries are parrots - False (Because, All parrots are Doves, and no Doves is canary, it gives no canary is parrot).

So, Only conclusions II and III follow.

Hence, the correct answer is "Option 4".

Q50. Answer: (b) In red blood cells

The correct answer is In red blood cells.

Key Points

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• The respiratory pigment in the human body is hemoglobin, which is a protein found in the red blood cells.

• Hemoglobin is responsible for carrying oxygen from the lungs to the different parts of the body and also helps in transporting carbon dioxide from the tissues to the lungs for exhalation.

• The red color of the blood is due to the presence of hemoglobin in the red blood cells.

• The concentration of hemoglobin in the blood can affect the oxygen-carrying capacity of the blood, and any abnormality in the hemoglobin levels can lead to various health conditions like anemia, sickle cell disease, etc.

Additional Information

• White blood cells, also known as leukocytes, are responsible for the immune response in the body.

• They travel throughout the bloodstream, initiating cellular and inflammatory reactions to infections or wounds.

• Plasma is the liquid component of the blood that carries various nutrients, hormones, and waste products.

• Water and salts that are absorbed through the digestive tract combine to make plasma.

Q51. Answer: (a) 3/5

Calculation:

Let the fraction be x/y

First case,

$(x + 2)/(y + 5) = 1/2$

$\Rightarrow 2x + 4 = y + 5 \rightarrow$ equation 1

Second case,

$(x – 2)/(y - 2) = 1/3$

$\Rightarrow 3x – 6 = y - 2 \rightarrow$ equation 2

On solving equations 1 and 2, we get

$x = 3$ and $y = 5$

Therefore The fraction is 3/5

Q52. Answer: (d) 2017

The correct answer is 2017.

Key Points

• Union of India Budget is the annual financial statement of the Government of India that outlines the estimated revenues and expenditures for the upcoming fiscal year.

• In 2017, the Union of India Budget was presented on 1 February for the first time, marking a departure from the earlier practice of presenting it on the last working day of February.

• In 2015, the Union of India Budget was presented on the last working day of February, which was the practice until 2016.

• In 2021, the Union of India Budget was presented on 1 February.

Additional Information

• On November 26, 1947, Sir R.K. Shanmugham Chetty, the country's first finance minister, unveiled the nation's first union budget.

• Article 112 of the Indian Constitution refers to the Union Budget as the Annual Financial Statement.

• Revenue Budget and Capital Budget are two categories of the Union Budget.

• Since 2019, Nirmala Sitharaman has held the positions of Minister of Finance and Minister of Corporate Affairs in the Indian government.

Q53. Answer: (a) 54 √3

Shortcut Trick

Area of a regular hexagon = 6 × Area of an equilateral triangle

Area = $6 \times (\sqrt{3}/4) \times \text{side}^2$

Area = $6 \times (\sqrt{3}/4) \times 6^2 = 6 \times (\sqrt{3}/4) \times 36$

Area = $6 \times 9\sqrt{3} = 54\sqrt{3}$ cm²

Therefore The correct answer is $54\sqrt{3}$ cm².

Alternate Method

Given:

Side length of regular hexagon (a) = 6 cm

Formula Used:

Area of Regular Hexagon = $[3\sqrt{3} / 2] \times a^2$

Calculations:

=> Area = [3√3 / 2] × (6)²

=> Area = [3√3 / 2] × 36

=> Area = 3√3 × 18

=> Area = 54√3 cm²

Therefore The correct answer is 54√3 cm².

Additional Information

Perimeter of Regular Hexagon

The total boundary length is calculated as P = 6 × a, where 'a' is the side length.

Interior Angles

Each interior angle of a regular hexagon is 120°. The sum of all interior angles is 720°.

Circumradius and Inradius

Circumradius (R) = a and Inradius (r) = (√3/2) × a.

Q54. Answer: (d) 16/3

Shortcut Trick

Given ratio a : b = 4 : 3. Let a = 4k and b = 3k.

Substitute in 3a + 2b = 24 → 3(4k) + 2(3k) = 24 → 12k + 6k = 18k = 24.

Find k = 24 ÷ 18 = 4/3.

Value of a = 4k = 4 × (4/3) = 16/3.

Therefore The correct answer is 16/3.

Alternate Method

Given: a/b = 4/3 and 3a + 2b = 24

Formula Used: Substitution Method for Linear Equations

=> From a/b = 4/3, we get b = 3a/4.

=> Substitute b in 3a + 2b = 24:

=> 3a + 2(3a/4) = 24

=> 3a + 3a/2 = 24

=> (6a + 3a)/2 = 24

=> 9a/2 = 24

=> 9a = 48

=> a = 48/9 = 16/3

Therefore The correct answer is 16/3.

Additional Information

Ratio and Proportion

If a/b = c/d, then a = bk where k is a constant. This helps in reducing variables in linear equations.

Componendo and Dividendo

If a/b = c/d, then (a+b)/(a-b) = (c+d)/(c-d). Useful for solving complex fractional equations.

Substitution Method

Express one variable in terms of another from the simplest equation and substitute it into the other to find the unknown values.

Q55. Answer: (d) Rowlatt Act

The correct answer is Rowlatt Act.

Key Points

• Mahatma Gandhi decided to launch nationwide Satyagraha against the Rowlatt Act, which was passed by the British government in 1919.

• The Rowlatt Act allowed the British government to imprison any person without trial, and it was seen as a direct attack on the civil liberties of the Indian people.

• The Satyagraha movement led by Mahatma Gandhi against the Rowlatt Act was one of the first mass movements against British rule in India, and it played a significant role in the Indian independence movement.

Additional Information

• The Regulating Act of 1773 was the first major British law on the governance of India.

• It was an Act of the British Parliament designed to restructure the East India Company's administration of its dominion over India.

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• The Inland Emigration Act of 1859 regulated the movement of Indian laborers.
• It made it illegal for Assamese plantation laborers to leave the tea estate without authorization.
• The Pitt's India Act of 1784 reformed the East India Company's governance of India.
• In order to address the shortcomings of the Regulating Act of 1773, it was passed by the British Parliament.

Q56. Answer: (b) 90

Shortcut Trick

For fourth proportion (d) of a, b, c, the logic is d = (b × c) ÷ a.

Given values are 12, 24, 45.

Fourth proportion = (24 × 45) ÷ 12

Fourth proportion = 2 × 45 = 90

Therefore The correct answer is 90.

Alternate Method

Given: Three numbers 12, 24, and 45.

Formula Used: If a, b, c, d are in proportion, then a : b = c : d, which implies a × d = b × c.

Let the fourth proportional be x.

=> 12 : 24 = 45 : x

=> 12 ÷ 24 = 45 ÷ x

=> 1 ÷ 2 = 45 ÷ x

=> x = 45 × 2

=> x = 90

Therefore The correct answer is 90.

Additional Information

Third Proportional

For two numbers a and b, the third proportional c is calculated as a : b = b : c, or $c = b^2 \div a$.

Mean Proportional

The mean proportional between two numbers a and b is $\sqrt{(a \times b)}$.

Continued Proportion

Numbers a, b, c are in continued proportion if a : b = b : c.

Q57. Answer: (a) Oceans

The correct answer is Oceans.

Key Points

• Panthalassa refers to the vast global ocean that surrounded the supercontinent Pangaea during the Paleozoic and Mesozoic eras.
• The name comes from the Greek words "pan" meaning all and "thalassa" meaning sea.
• Panthalassa covered about 70% of the Earth's surface and was home to a diverse range of marine life.
• The breakup of Pangaea and the formation of modern continents caused the oceanic basins to expand and Panthalassa gradually disappeared.

Additional Information

• The atmosphere refers to the layer of gases surrounding the Earth.
• About 78% of the gases in Earth's atmosphere are nitrogen, 21% are oxygen, and 1% are other gases.
• Mountains are large landforms that rise above the surrounding terrain.
• Typically, they have ridges that are sharp or rounded, steep, sloping sides, and a high point known as a peak or summit.
• Soil is the mixture of organic and inorganic materials that support plant growth.
• They obtain their nutrients and water from the soil.

Q58. Answer: (c) Wetland's action for people and nature

The correct answer is Wetland's action for people and nature.

Key Points

• Wetlands are vital for the survival of various species of plants and animals.
• They also provide numerous ecosystem services, including water purification, flood control, and carbon sequestration.
• The theme of this year's World Wetland Day, "Wetland's action for people and nature", emphasizes the importance of wetlands

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in providing benefits to people and nature.

Additional Information

• "Wetlands and Biodiversity," also highlights the significance of wetlands in supporting biodiversity.

• Wetlands are home to various plant and animal species, many of which are endangered.

• "Wetlands and climate change," emphasizes the role of wetlands in mitigating the impacts of climate change.

• Wetlands store carbon and help reduce greenhouse gas emissions.

• "Wetlands and water," highlights the importance of wetlands in providing clean water.

• Wetlands act as natural filters, removing pollutants and impurities from water.

Q59. Answer: (c) L P P M B J

Given:

Number / sign	**@**	**%**	**!**	**4**	**2**	**5**	**#**	**?**	**•**	**=**	**3**	**&**	**7**	**<**
Code	C	L	N	D	M	B	R	A	P	J	X	W	E	H

Conditions	**Coded As**
First element is a sign and the last element is a number	Codes for these two (the first and the last elements) must be interrupted
First element is an odd number and the last element is an even number	First and last elements should be coded as the first
Second and third elements are two numbers or markings	Third element must be coded to the second element

Now, the group of numbers and symbols is: % + < 2 5 =

Here, Third conditions followed in the given group,

So, Codes of the First and last elements are to be interchanged.

Then, the code for '% + < 2 5 =' is → 'L P P M B J'.

Hence, the correct answer is "Option 3".

Q60. Answer: (d) 5%

Shortcut Trick

Total Interest in percentage = (3/5) × 100 = 60%

In Simple Interest, interest is distributed equally over the Time Period.

Annual Rate (R) = Total Interest % ÷ Time

R = 60% ÷ 12 = 5%

Therefore The correct answer is 5 %.

Alternate Method

Given:

Time (T) = 12 years

Simple Interest (SI) = 3/5 × Principal (P)

Formula Used:

Rate (R) = (SI × 100) ÷ (P × T)

Calculations:

=> Let Principal (P) = 5 units

=> Simple Interest (SI) = 3/5 × 5 = 3 units

=> R = (3 × 100) ÷ (5 × 12)

=> R = 300 ÷ 60

=> R = 5%

Therefore The correct answer is 5 %.

Additional Information

Amount Formula

The total sum after interest is added is called Amount (A), where A = P + SI = P(1 + RT/100).

Simple Interest Property

Unlike Compound Interest, Simple Interest is calculated only on the original Principal for every year.

Relationship between Rate and Time

For a fixed amount of interest, the Rate of Interest is inversely proportional to the Time Period.

Q61. Answer: (c) 11 A

The correct answer is 11 A.

Key Points

• The current drawn by the appliance is directly proportional to the potential difference applied across its terminals, according to Ohm's law.

• Therefore, the new current can be calculated as I2 = (V2/V1) * I1, where I1 and V1 are the initial current and potential difference, and I2 and V2 are the new current and potential difference, respectively.

• Substituting the given values, we get I2 = (110/50) * 5 = 11 A.

• Hence, the correct answer is 11 A.

Additional Information

• Only when the given temperature and the other physical parameters stay constant does Ohm's law apply.

• In some components, the temperature rises when the current is increased.

• A light bulb's filament serves as an illustration of this, wherein increasing current causes the filament's temperature to rise.

• Ohm's law cannot be applied in this case.

• The filament of the lightbulb defies Ohm's Law.

Q62. Answer: (c) 18 years

Shortcut Trick

The ratio difference between 7 : 6 and 8 : 7 is exactly 1 unit (8−7 = 1 and 7−6 = 1).

Since the time gap is 6 years, 1 unit = 6 years.

Present ages: Man = 7 × 6 = 42 years, Wife = 6 × 6 = 36 years.

Marriage ratio was 4 : 3; let marriage be x years ago: (42−x)/(36−x) = 4/3.

By inspection: (42−18)/(36−18) = 24/12 = 2/1, but if we check 18 years, 42−18=24 and 36−18=18; 24:18 = 4:3.

Therefore The correct answer is 18 years.

Alternate Method

Given: Present ratio = 7 : 6, Future ratio (after 6 yrs) = 8 : 7, Marriage ratio = 4 : 3.

Formula: Ratio = Age1 / Age2

=> Let present ages be 7k and 6k.

=> (7k + 6) / (6k + 6) = 8 / 7

=> 49k + 42 = 48k + 48

=> k = 6

=> Present ages: Man = 42, Wife = 36

=> Let marriage occur n years ago: (42 − n) / (36 − n) = 4 / 3

=> 126 − 3n = 144 − 4n

=> n = 144 − 126 = 18

Therefore The correct answer is 18 years.

Additional Information

Ratio Difference Method

When the absolute difference between two ages remains constant, ensure the ratio difference is also equalized by multiplying the ratios by the difference of the other ratio.

Age Calculations

Age after n years = Present Age + n. Age n years ago = Present Age − n.

Constant Age Gap

The difference between the ages of two people never changes regardless of the number of years passed.

Q63. Answer: (a) Odisha

The correct answer is Odisha.

Key Points

• Mahendragiri Hills is located in the Paralakhemundi region of Gajapati district in Odisha.

• Mahendragiri Hills is a part of the Eastern Ghats mountain range, and it is also known as the Mahendra Parvat.

• It is considered to be a sacred place by the locals, and it is believed that Lord Parashurama, an incarnation of Lord Vishnu, meditated here.

Additional Information

• At 3,636 meters, Sandakphu is the highest hill in West Bengal.

• At 3,600 meters, Phalut, sometimes known as Falut, is the second-highest peak in West Bengal, India.

• Jharkhand is home to several hill ranges, including the Chota Nagpur Plateau and the Parasnath Hills.

• Chhattisgarh has several hills and mountain ranges, including the Maikal Hills and the Satpura Range.

Q64. Answer: (c) iii, iv

The correct answer is iii, iv.

Key Points

• Statement (ii) is correct as Starting from lithium (Li), counting every element up to sodium (Na), sodium indeed is the eighth element (Li, Be, B, C, N, O, F, Na).

• Statement (iv) is also incorrect as Newlands' Law of Octaves was found to be inaccurate for elements beyond calcium, not magnesium. The significant deviation happens after calcium.

• Statement (iii) is incorrect as Calcium (Ca) is actually the 17th element after Beryllium (Be), not the eighth. Therefore, statement (iii) is incorrect.

• Statement (i) is also correct as Newland did arrange the elements in the order of increasing atomic masses and gave the law of Octaves.

Additional Information

• John Newlands was an English chemist who arranged the elements in the order of increasing atomic masses and gave the law of Octaves in 1864.

• The law of Octaves states that every eighth element has properties similar to that of the first element when arranged in the order of increasing atomic masses.

• However, this law was applicable only up to Calcium and not beyond that as after Calcium, every eighth element did not possess properties similar to that of the first element.

• The modern periodic table is based on the atomic number of the elements and not their atomic masses.

• The elements are arranged in increasing order of atomic number in the modern periodic table.

Q65. Answer: (c) sec θ + tan θ

Shortcut Trick

Rationalize the numerator: $\sqrt{((1 + \sin\theta) / (1 - \sin\theta))} \times \sqrt{((1 + \sin\theta) / (1 + \sin\theta))}$

=> $\sqrt{((1 + \sin\theta)^2 / (1 - \sin^2\theta))} = (1 + \sin\theta) / \cos\theta$

=> $(1 / \cos\theta) + (\sin\theta / \cos\theta) = \sec\theta + \tan\theta$

Therefore The correct answer is sec θ + tan θ.

Alternate Method

Given: expression $\sqrt{((1 + \sin\theta) / (1 - \sin\theta))}$

Formula Used: $\sin^2\theta + \cos^2\theta = 1$; $\sec\theta = 1/\cos\theta$; $\tan\theta = \sin\theta/\cos\theta$

=> Multiply numerator and denominator by $(1 + \sin\theta)$ under the square root.

=> $\sqrt{[((1 + \sin\theta)(1 + \sin\theta)) / ((1 - \sin\theta)(1 + \sin\theta))]}$

=> $\sqrt{[(1 + \sin\theta)^2 / (1 - \sin^2\theta)]}$

=> $\sqrt{[(1 + \sin\theta)^2 / \cos^2\theta]}$

=> $(1 + \sin\theta) / \cos\theta$

=> $1/\cos\theta + \sin\theta/\cos\theta$

=> $\sec\theta + \tan\theta$

Therefore The correct answer is sec θ + tan θ.

Additional Information

Trigonometric Identities

Standard identities include $1 + \tan^2\theta = \sec^2\theta$ and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Rationalization Rule

When simplifying $\sqrt{((1 \pm \sin\theta)/(1 -/+ \sin\theta))}$, multiplying by the conjugate of the denominator converts the expression into a perfect square.

Q66. Answer: (b) 19

Shortcut Trick

Total Sum = Mean × n = 21 × 7 = 147.

Sum of terms = (11 + 17 + 1 + 19 − 4 + 5) + (x + 3x + 2x + x) = 49 + 7x.

Equating: 49 + 7x = 147 => 7x = 98 => x = 14.

Data set becomes: 11, 17, 15, 42, 19, 24, 19.

The value 19 repeats most frequently (twice).

Therefore The correct answer is 19.

Alternate Method

Given:

Data: 11, 17, x + 1, 3x, 19, 2x − 4, x + 5

Mean = 21, Total terms (n) = 7

Formula Used:

Mean = (Sum of all observations) ÷ (Total number of observations)

Mode = The observation with the highest frequency.

Calculations:

=> Mean = (11 + 17 + x + 1 + 3x + 19 + 2x − 4 + x + 5) ÷ 7

=> 21 = (49 + 7x) ÷ 7

=> 21 × 7 = 49 + 7x

=> 147 − 49 = 7x

=> 98 = 7x => x = 14

Now, finding all observations:

=> x + 1 = 14 + 1 = 15

=> 3x = 3 × 14 = 42

=> 2x − 4 = 2(14) − 4 = 24

=> x + 5 = 14 + 5 = 19

Observations list: 11, 17, 15, 42, 19, 24, 19

=> Frequency of 19 = 2; Frequency of others = 1

Therefore The correct answer is 19.

Additional Information

Arithmetic Mean

The average of a set of numbers, calculated by dividing the sum of the values by the number of values.

Mode

The value that appears most frequently in a data set. A set can be unimodal, bimodal, or multimodal.

Empirical Relationship

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

Median

The middle value of a data set when it is arranged in ascending or descending order.

Q67. Answer: (b) 66

The logic followed here is:

So, '66' will replace the question mark in the given series.

Hence, the correct answer is "Option 2".

Q68. Answer: (d) Neither conclusion 1 nor 2 is true

Given Statement: A < Q, Q < X, E = A < T

After combining the statements: T > E = A < Q < X

Now,

Conclusions:

1. T < E → False (E = A < T It gives T > E)

2. A = X → False (A < Q < X It gives A < X)

Here, Neither conclusion 1 nor 2 is true.

Hence, the correct answer is "Option 4".

Q69. Answer: (c) X-chromosome is bigger, whereas Y is smaller.

The correct answer is X-chromosome is bigger, whereas Y is smaller.

Key Points

• The X chromosome is larger than the Y chromosome in humans.

• The X chromosome contains more genes than the Y chromosome.

• The X chromosome plays a crucial role in determining the sex of an individual, as females have two copies of the X chromosome (XX) while males have one X and one Y chromosome (XY).

• The Y chromosome is responsible for the development of male-specific characteristics.

Additional Information

• There are 23 pairs of chromosomes in humans.

• Only one pair, the "Sex Chromosome," which actively participates in the process of determining a person's sex, is among these 23 pairings; the other 22 pairs are autosomes.

• Both sex chromosomal sets are carried by males and females.

• A few plant species, animals, insects, and humans all have the XY sex-determination system.

• Regardless of gender, every kid will receive an X chromosome from their mother.

• Therefore, the type of chromosome that the offspring get from their father will decide their sex.

• A child with the X chromosome will be a girl, and a child with the Y chromosome will be a male.

Q70. Answer: (c) 11/5

Shortcut Trick

For any quadratic equation of the form $ax^2 + bx + c = 0$, the sum of the roots is given by the formula $-b/a$.

In the given equation $5x^2 - 11x + 6 = 0$, we have $a = 5$ and $b = -11$.

Sum of roots = $-(-11) / 5 = 11/5$.

Therefore The correct answer is 11/5.

Alternate Method

Given:

The quadratic equation is $5x^2 - 11x + 6 = 0$.

Formula Used:

If α and β are the roots of the equation $ax^2 + bx + c = 0$, then:

Sum of roots (α + β) = −(Coefficient of x) / (Coefficient of x^2) = $-b/a$

Calculations:

=> Comparing $5x^2 - 11x + 6 = 0$ with $ax^2 + bx + c = 0$:

=> a = 5

=> b = −11

=> c = 6

=> Sum of roots = $-b/a$

=> Sum of roots = $-(-11) / 5$

=> Sum of roots = 11/5

Therefore The correct answer is 11/5.

Additional Information

Product of Roots

The product of the roots (αβ) of a quadratic equation $ax^2 + bx + c = 0$ is given by c/a. For the given equation, the product is 6/5.

Discriminant and Nature of Roots

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

Quadratic Formula

The roots of the equation can be found using the formula $x = [-b \pm \sqrt{(b^2 - 4ac)}] / 2a$.

Q71. Answer: (d) Bodh Gaya

The correct answer is Bodh Gaya.

Key Points

• Gautam Buddha, also known as Siddhartha Gautama, was a spiritual leader and founder of Buddhism.
• He attained enlightenment under a Bodhi tree in Bodh Gaya, Bihar, India.
• Bodh Gaya is one of the most important pilgrimage sites for Buddhists around the world.
• The Mahabodhi Temple, located in Bodh Gaya, is a UNESCO World Heritage Site and attracts millions of visitors every year.
Additional Information
• Lumbini, located in Nepal, is the birthplace of Gautam Buddha.
• It is also a UNESCO World Heritage Site and a popular destination for Buddhist pilgrims.
• Sanchi, located in Madhya Pradesh, India, is famous for its Buddhist stupas and monuments.
• These were built by the Mauryan emperor Ashoka in the 3rd century BCE.
• Kaushambi, located in Uttar Pradesh, India, is an ancient city that was an important center for Buddhism in the 6th century BCE.
• It is believed that Gautam Buddha visited Kaushambi several times during his lifetime.

Q72. Answer: (c) 66 years

Shortcut Trick
Present Age Ratio of Rekha and Sister = 4 : 7
Total Ratio parts = 4 + 7 = 11 units.
Since the total age must be a multiple of 11, check the options.
Only 44 and 66 are multiples of 11. Using 12 years ago ratio 2 : 5:
If Total = 66, then ages are 24 and 42. 12 years ago: (24−12) : (42−12) = 12 : 30 = 2 : 5. (Matches)
Therefore The correct answer is 66 years.
Alternate Method
Given:
Present age ratio = 4 : 7
Age 12 years ago = 2/5 of sister's age
Let Rekha's present age be 4x and Sister's present age be 7x.
=> 12 years ago, Rekha's age = 4x − 12
=> 12 years ago, Sister's age = 7x − 12
=> (4x − 12) = (2/5) × (7x − 12)
=> 5 × (4x − 12) = 2 × (7x − 12)
=> 20x − 60 = 14x − 24
=> 20x − 14x = 60 − 24
=> 6x = 36
=> x = 6
=> Total present age = 4x + 7x = 11x
=> Total present age = 11 × 6 = 66 years
Therefore The correct answer is 66 years.
Additional Information
Ratio Difference Method
If the age difference between two ratios is constant, make the difference between ratio parts equal to solve for 1 unit value.
Age Difference Property
The difference between the ages of two persons remains constant throughout their lives, regardless of the years passed.
Total Age Calculation
Sum of ages after 'n' years = Present Sum + (Number of persons × n).

Q73. Answer: (d) 50%

Shortcut Trick
Let Marked Price (MP) = 100.
Cost Price (CP) = 64% of 100 = 64.
Selling Price (SP) = MP × (100 − Discount%) ÷ 100 = 100 × 96 ÷ 100 = 96.
Profit = SP − CP = 96 − 64 = 32.
Gain % = (Profit ÷ CP) × 100 = (32 ÷ 64) × 100 = 50%.
Therefore The correct answer is 50 %.

Alternate Method

Given: CP = 64% of MP, Discount = 4%.

Formulas: SP = MP × (1 − Discount%); Profit% = [(SP − CP) ÷ CP] × 100.

=> Let Marked Price be M. Then Cost Price = 0.64M.

=> Selling Price after 4% discount = M × (100 − 4) ÷ 100 = 0.96M.

=> Gain = SP − CP = 0.96M − 0.64M = 0.32M.

=> Gain % = (0.32M ÷ 0.64M) × 100 = (1 ÷ 2) × 100 = 50%.

Therefore The correct answer is 50 %.

Additional Information

Relation between CP and MP

The ratio of Cost Price to Marked Price can be expressed as CP ÷ MP = (100 − Discount%) ÷ (100 + Profit%).

Marked Price & Discount

Marked Price is the price printed on the label, and Discount is always calculated on this price to arrive at the Selling Price.

Q74. Answer: (a) Haryana

The correct answer is Haryana.

Key Points

• Haryana topped the 4th Khelo India Youth Games 2021 medals tally by winning a total of 102 medals, including 38 gold, 26 silver, and 38 bronze medals.

• The Khelo India Youth Games is an initiative by the Ministry of Youth Affairs and Sports, Government of India, to identify and promote young talent across various sports disciplines in the country.

• The 4th edition of the Khelo India Youth Games was held in Guwahati, Assam, from 10th to 22nd January 2020, and saw participation from over 6,000 athletes from 37 states and union territories.

Additional Information

• Rajasthan secured the 2nd position in the medals tally with a total of 73 medals, including 22 gold, 27 silver, and 24 bronze medals.

• Maharashtra stood at the 3rd position with 56 medals, including 18 gold, 19 silver, and 19 bronze medals.

• Maharashtra became victorious overall in the Khelo India Youth Games - 2022, having won 161 medals in total, comprising 56 gold, 55 silver, and 50 bronze.

• Conversely, Haryana secured the second spot with a total of 128 medals, including of 41 gold, 32 silver, and 55 bronze.

• With 96 medals, including 39 gold, the host state of Madhya Pradesh came in third.

Q75. Answer: (c) a - Neutrophil, b - Eosinophil, c - Basophil, d - Lymphocyte, e - Monocyte

The correct answer is a - Neutrophil, b - Eosinophil, c - Basophil, d - Lymphocyte, e - Monocyte.

Key Points

• Neutrophil, Eosinophil, Basophil, Lymphocyte, Monocyte correctly labels all the white blood cells in the diagram.

• Neutrophil is labelled as 'a', Eosinophil is labelled as 'b', Basophil is labelled as 'c', Lymphocyte is labelled as 'e' and Monocyte is labelled as 'd'.

• Another name for white blood cells is leukocytes.

• As a component of the immune system, they take part in the humoral as well as innate immunological responses.

• They travel throughout the bloodstream, initiating cellular and inflammatory reactions to infections or wounds.

Additional Information

• Neutrophils are the most common type of white blood cells and play a crucial role in fighting off bacterial infections.

• Eosinophils are involved in the body's response to parasitic infections and allergic reactions.

• Basophils release histamine during an allergic reaction and play a role in the body's immune response.

• Lymphocytes are responsible for recognizing and attacking specific foreign invaders, such as viruses and bacteria.

• Monocytes are involved in the body's immune response by engulfing and digesting foreign substances.

Q76. Answer: (c) 122

The logic followed here is:

So, '122' will replace the question mark in the given series.

Hence, the correct answer is "Option 3".

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Q77. Answer: (d) Only (iii)

The correct answer is Only (iii).

Key Points

• The salt which will give an aqueous solution having pH of almost 7 is K2SO4.

• K2SO4 is a neutral salt as it is formed by the combination of a strong base (KOH) and a strong acid (H2SO4).

• K2SO4 will not affect the pH of the aqueous solution as it does not produce any H+ or OH- ions.

• K2SO4 is used as a fertilizer in agriculture as it provides essential nutrients to the plants.

Additional Information

• The keyword mentioned in the question is pH, which is a measure of the acidity or basicity of a solution.

• NH4Cl is commonly used as a buffer in laboratory experiments as it can maintain a constant pH in the solution.

• NH4Cl is an acidic salt as NH4+ ion is acidic in nature and it will produce H+ ions in aqueous solution, resulting in a lower pH.

• Na2CO3 is a basic salt as CO32- ion is basic in nature and it will produce OH- ions in aqueous solution, resulting in a higher pH.

• Na2CO3 is used in the manufacturing of glass, detergents, and paper as it can act as a cleaning agent due to its basic nature.

Q78. Answer: (b) Two

Given word: 'PARTICLE'

Now, checking the pairs in both forward and backward directions:

The pairs in forward direction are: PR and CE

And, no pairs formed in backward direction.

So, Total 'Two' pairs are formed from the given word.

Hence, the correct answer is "Option 2".

Q79. Answer: (b) Six

The correct answer is six.

Key Points

• Students from six minority communities under the Maulana Azad Fellowship Scheme (MANF) get five-year fellowships in the form of financial assistance notified by the Central Government, to pursue M. Phil and Ph.D.

• The minority communities are Buddhist, Christian, Jain, Muslim, Parsi and Sikh.

• The MANF scheme was launched by the Ministry of Minority Affairs, Government of India, in 2003 to provide financial assistance to students from minority communities to pursue higher education.

• The scheme aims to provide opportunities to minority students to undertake advanced studies and research in science, humanities, social sciences, and engineering and technology.

Additional Information

• The Maulana Azad Fellowship Scheme (MANF) is named after Maulana Abul Kalam Azad, who was an Indian scholar and the first education minister of independent India.

• The MANF scheme is implemented through the University Grants Commission (UGC), which is the apex body for higher education in India.

• The MANF scheme provides financial assistance to students from minority communities to pursue M. Phil and Ph.D. in universities, deemed universities, and research institutions recognized by the UGC.

• The MANF scheme provides financial assistance in the form of a monthly stipend, contingency grant, and other benefits.

• The scheme also provides a separate ad-hoc grant to the universities and institutions to provide infrastructure and other facilities to the MANF scholars.

Q80. Answer: (a) G

Given: Six teachers, C, D, E, F, G and H, are sitting around a circular table.

They were facing the centre of the table.

1) Exactly two people sit between H and D.

2) E is sitting to the immediate right of H.

3) F is sitting to the immediate left of C.

4) D is an immediate neighbour of both G and F.

Here, 'G' is the third person to the left of C.

Hence, the correct answer is "Option 1".

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Q81. Answer: (d) rhombus

Shortcut Trick

A parallelogram with all sides equal is either a rhombus or a square.

If the diagonals are equal, it is a square.

If the diagonals are unequal, it is a rhombus.

Therefore The correct answer is rhombus.

Alternate Method

Given: A parallelogram with all sides equal and diagonals unequal.

Formula Used: Properties of Quadrilaterals.

=> In a parallelogram, opposite sides are parallel and equal.

=> If all sides are equal (AB = BC = CD = DA), the figure is a rhombus.

=> In a rhombus, the diagonals (d1 and d2) bisect each other at 90° but are not equal in length.

=> If the diagonals were equal, the rhombus would become a square.

=> A rectangle has equal diagonals but only opposite sides are equal.

=> A kite has two pairs of equal adjacent sides but is not necessarily a parallelogram.

Therefore The correct answer is rhombus.

Additional Information

Q82. Answer: (a) North

Given:

Six houses, K, L, M, N, O and P, are located in the same colony.

L is 50 m to the south of K.

P is 250 m to the west of K.

O is 200 m to the north of K.

N is 190 m to the south of L.

M is 150 m to the east of L.

So, House O is in 'North' direction from House L.

Hence, the correct answer is "Option 1".

Q83. Answer: (a) $2^3 \times 3^3 \times 5^2 \times 7^2$

Shortcut Trick

To find the LCM of numbers expressed as prime factors, take the highest power of every prime factor present in any of the numbers.

Max power of 2 → 2^3

Max power of 3 → 3^3

Max power of 5 → 5^2

Max power of 7 → 7^2

Therefore The correct answer is $2^3 \times 3^3 \times 5^2 \times 7^2$.

Alternate Method

Given:

Number 1 = $2^3 \times 3^2 \times 5^1$

Number 2 = $2^2 \times 5^2 \times 7^1$

Number 3 = $3^3 \times 5^2 \times 7^2$

Formula Used:

LCM = Product of the highest powers of all prime factors involved.

Calculations:

=> Prime factors involved are 2, 3, 5, and 7.

=> Highest power of 2: max(2^3, 2^2, 2^0) = 2^3

=> Highest power of 3: max(3^2, 3^0, 3^3) = 3^3

=> Highest power of 5: max(5^1, 5^2, 5^2) = 5^2

=> Highest power of 7: max(7^0, 7^1, 7^2) = 7^2

=> LCM = $2^3 \times 3^3 \times 5^2 \times 7^2$

Therefore The correct answer is $2^3 \times 3^3 \times 5^2 \times 7^2$.

Additional Information

HCF of Prime Factors

To find the HCF, take the lowest power of the common prime factors only.

Product Rule

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

LCM of Fractions

LCM of fractions = LCM of Numerators ÷ HCF of Denominators.

Q84. Answer: (c) Both A and B

The correct answer is Both A and B.

Key Points

• Concave mirrors can also form virtual and erect images depending on the position of the object.

• Convex mirrors always form virtual and diminished images, which are smaller than the actual size of the object.

• Plane mirrors always form virtual and erect images, which are the same size as the actual object.

• The key term mentioned in the question is "virtual and erect image," which means that the image formed is upright and appears to be behind the mirror.

Additional Information

• The law of reflection explains why a mirror is classified as a reflecting surface.

• The reflected images with regular dimensions that are flipped from left to right are the images created by a plane mirror.

• The spherical mirrors with an outward curve are called convex mirrors.

• The spherical mirrors that are bent inward are called concave mirrors.

Q85. Answer: (d) February

Given: Six teams named P, Q, R, S, T and U won tournaments in different months of the same year, viz. January, February, March, April, May and June.

1) R won the tournament in January.

2) Exactly two teams won the tournaments between the months of R and S.

3) P won the tournament in the month immediately before S.

Month	Team Wins
January	R
February	
March	P
April	S
May	
June	

4) Q won in the month immediately before U.

Month	Team Wins
January	R
February	
March	P
April	S
May	Q
June	U

And, T won the tournament in February.

Month	Team Wins
January	R

February	T
March	P
April	S
May	Q
June	U

So, 'T' win the tournament in 'February' month.

Hence, the correct answer is "Option 4".

Q86. Answer: (b) 1/3, 2/5, 4/7, 3/5, 5/6

Calculation

1/3 = 33.33%

4/7 = 57.14%

2/5 = 40%

5/6 = 83.33

3/5 = 60%

1/3 < 2/5 < 4/7 < 3/5 < 5/6

The answer is 1/3, 2/5, 4/7, 3/5, 5/6

Q87. Answer: (d) United Nations Development Programme (UNDP)

The correct answer is United Nations Development Programme (UNDP).

Key Points

• Atal Innovation Mission (AIM) and NITI Aayog have launched the Community Innovators Fellowship (CIF) in collaboration with the United Nations Development Programme (UNDP) to support women innovators in India.

• The CIF aims to encourage and support women entrepreneurs and innovators who are working on innovative solutions to the most pressing problems faced by communities across the country.

• The fellowship will provide financial support, mentoring, and networking opportunities to the selected innovators.

• The launch of the CIF marks the International Day of Women and Girls in Science, which is celebrated on February 11 every year to promote gender equality in science, technology, engineering, and mathematics (STEM) fields.

Additional Information

• Indian Institute of Science (IISc) is a premier research institute located in Bangalore.

• The Ministry of Women and Child Development is a government ministry in India that is responsible for the formulation and implementation of policies and programs for the welfare of women and children.

• Smriti Irani is the Union Minister.

• In India, the Ministry of Science and Technology contains the Department of Science and Technology.

• It's headquarter is in New Delhi.

• The United Nations Development Programme (UNDP) is a global development agency that works to eradicate poverty, reduce inequalities, and promote sustainable development.

Q88. Answer: (c) R

Given: Six frogs, P, Q, R, S, T and U, were sitting around a circular pond, facing the centre.

1) T was second to the left of S.

2) There are exactly two frogs between Q and S.

3) P was second to the right of U.

4) P is not seated three places to the right of Q.

And, frog R will sit on the remaining place.

Here, frog 'R' was sitting to the immediate right of P.

Hence, the correct answer is "Option 3".

Q89. Answer: (a) Eggshells, Paper, Stale biscuits, Fruits, Vegetable peels

The correct answer is Eggshells, Paper, Stale biscuits, Fruits, Vegetable peels.

Key Points

• Biodegradable substances are those that can be decomposed by natural processes, such as microorganisms and bacteria, into

harmless substances that do not harm the environment.

• The option that has only biodegradable substances includes eggshells, paper, stale biscuits, fruits, and vegetable peels.

• Eggshells are biodegradable and can be used as fertilizer for plants.

• Paper is made from wood pulp, which is a natural material, and can be recycled or composted.

• Stale biscuits, fruits, and vegetable peels are organic waste that can be composted and used as natural fertilizer.

Additional Information

• Since non-biodegradable materials do not readily react with or disintegrate in soil, they are not easily influenced by natural processes.

• Batteries and metals are non-biodegradable substances that can harm the environment if not disposed of properly.

• Glass can be recycled but takes a long time to decompose.

• Stale bread and vegetable peelings can be composted.

• Tetra packs are made of multiple layers of materials, including plastic and aluminum, and take a long time to decompose.

• Leather is a natural material but takes a long time to decompose.

Q90. Answer: (a) Deep Ocean Mission

The correct answer is Deep Ocean Mission.

Key Points

• Deep Ocean Mission is a new mission announced in the Union Budget of India, 2021, which aims to explore and utilize the oceanic resources in a sustainable manner.

• The mission will focus on deep-sea mining, ocean climate change advisory services, underwater vehicles and underwater robotics, and ocean exploration.

• The mission is expected to provide a boost to the Blue Economy of India, which refers to the sustainable use of ocean resources for economic growth, job creation, and environmental sustainability.

• The mission will also contribute to India's deep-sea scientific research capabilities and strengthen its maritime security.

Additional Information

• Samundra Setu Mission is a mission launched by the Indian Navy in 2020.

• It aimed to repatriate Indian citizens stranded abroad during the COVID-19 pandemic.

• Blue Economy Mission is related to the Deep Ocean Mission as it aims to promote sustainable use of ocean resources for economic growth, job creation, and environmental sustainability.

• Maritime Exercise Mission refers to joint exercises conducted by the Indian Navy with other navies.

• It is done to enhance maritime security and interoperability.

Q91. Answer: (a) Only (a)

The correct answer is Only (a).

Key Points

• Red light has the highest wavelength among all the colors of the visible spectrum, and hence it has the minimum refractive index in glass.

• This means it bends the least and travels the fastest in glass.

• Violet light has the shortest wavelength among all the colors of the visible spectrum, and hence it deviates the most while passing through a prism.

• This means it bends the most and travels the slowest in glass.

• Different colors of light have different speeds in glass due to their different wavelengths and refractive indices.

Additional Information

• The phenomenon of dispersion is the separation of white light into its constituent colors due to their different refractive indices.

• This happens because different colors of light bend at different angles while passing through a medium, such as a glass prism.

• Refractive index is a measure of the speed of light in a medium, and it depends on the wavelength of light.

• The shorter the wavelength, the higher the refractive index.

Q92. Answer: (a) During respiration

The correct answer is During respiration.

Key Points

• Respiration is the process of converting glucose into energy in the presence of oxygen.

• During this process, carbon dioxide is produced as a waste product and released into the atmosphere.

• Plants undergo respiration just like animals, although they also undergo photosynthesis where they produce oxygen and

glucose.

• During photosynthesis, plants absorb carbon dioxide from the atmosphere and release oxygen.

• Transpiration is the process of water loss from plants through the stomata.

Additional Information

• Carbon dioxide is a greenhouse gas responsible for climate change.

• Plants play a crucial role in mitigating the effects of climate change by absorbing carbon dioxide from the atmosphere during photosynthesis and releasing oxygen.

• However, the burning of fossil fuels and deforestation have led to an increase in the concentration of carbon dioxide in the atmosphere.

• It is leading to global warming.

Q93. Answer: (a) Mg

The correct answer is Mg.

Key Points

• Aluminium is a highly reactive metal and can be displaced by metals that are more reactive than it in a solution containing aluminium sulphate.

• Magnesium (Mg) is more reactive than aluminium and can displace it from an aluminium sulphate solution.

• Mercury (Hg) is not a suitable option as it is a liquid metal and less reactive than aluminium.

• Iron (Fe) and Copper (Cu) are less reactive than aluminium and cannot displace it from an aluminium sulphate solution.

Additional Information

• Magnesium is a highly reactive metal and can react vigorously with many substances, including water and acids.

• Mercury is a liquid metal at room temperature and is commonly used in thermometers, barometers, and other scientific instruments.

• Iron is a relatively abundant metal and is used extensively in construction, manufacturing, and transportation industries.

• Copper is a highly conductive metal and is used in a variety of applications, including electrical wiring and plumbing systems.

Q94. Answer: (d) Mahashivratri

The correct answer is Mahashivratri.

Key Points

• Natyanjali Utsav is celebrated in Tamil Nadu every year on the occasion of Mahashivratri.

• The festival is dedicated to Lord Shiva and is celebrated in the temple town of Chidambaram.

• The festival is a tribute to Lord Nataraja, who is considered the lord of dance in Hindu mythology.

• During the festival, dancers from all over India come to Chidambaram to offer their dance performances to Lord Nataraja.

Additional Information

• Pongal is a harvest festival celebrated in Tamil Nadu.

• It's an occasion to give thanks to the Sun, Mother Nature, and all the farm animals that support a plentiful harvest.

• Janmashtami is the birthday of Lord Krishna.

• He is revered as a representation of god, love, and morality.

• Diwali is the festival of lights celebrated across India.

• The "victory of light over darkness, good over evil, and knowledge over ignorance" is symbolized by it spiritually.

Q95. Answer: (d) P > J

Given Statement: P = L > K > J < F < N

Now,

Conclusions:

1. J = L → False (L > K > J It gives J < L)

2. K = F → False (K > J < F No relation can be established between K and F)

3. N > K → False (K > J < F < N No relation can be established between N and K)

4. P > J → True (P = L > K > J It gives P > J)

Here, Conclusions 4 follows.

Hence, the correct answer is "Option 4".

Q96. Answer: (b) Muthoot Finance Ltd

The correct answer is Muthoot Finance Ltd.

Key Points

• Muthoot Finance Ltd provides loans only against gold jewellery and provides foreign exchange services, money transfer, wealth management services, travel and tourism services.

• Gold jewellery loans:

• Muthoot Finance Ltd provides loans only against gold jewellery.

• This means that customers can pledge their gold jewellery as collateral and get a loan against it.

• Foreign exchange services:

• Muthoot Finance Ltd also provides foreign exchange services where customers can buy and sell foreign currencies.

• Money transfer:

• Muthoot Finance Ltd provides money transfer services where customers can transfer money to other individuals or bank accounts.

• Wealth management services:

• Muthoot Finance Ltd provides wealth management services where customers can invest in various financial products such as mutual funds, fixed deposits, and insurance policies.

• Travel and tourism services:

• Muthoot Finance Ltd also provides travel and tourism services where customers can book flights, hotels, and holiday packages.

Additional Information

• Microfinance institutions are financial institutions that provide financial services such as loans, savings, and insurance to low-income individuals or groups who typically lack access to traditional banking services.

• Power Finance Corporation Ltd is a non-banking financial company that provides financial assistance to power projects and related activities.

• Aditya Birla Finance Ltd is a non-banking financial company that provides financial services such as corporate finance, capital market finance, and wealth management.

• Mahindra and Mahindra Financial Services Ltd is a non-banking financial company that provides financial services such as vehicle finance, home loans, and insurance.

Q97. Answer: (d) President

The correct answer is President.

Key Points

• The President is the head of the executive branch of the Indian government.

• The President is elected by an electoral college consisting of the elected members of both houses of Parliament and of the Legislative Assemblies of the States.

• The President holds the power to appoint the Prime Minister, other ministers, judges of the Supreme Court and High Courts, and other key officials.

• The President also has the power to promulgate ordinances when Parliament is not in session and to dissolve the Lok Sabha.

Additional Information

• The Lok Sabha Speaker is the presiding officer of the Lok Sabha, which is the lower house of the Indian Parliament.

• The Lok Sabha Speaker is responsible for maintaining order and decorum in the House and for conducting its business.

• The Lok Sabha Speaker is elected by the members of the Lok Sabha.

• The Vice President is the second-highest constitutional post in India after the President.

• The Vice President is elected by an electoral college consisting of the members of both houses of Parliament.

• The Vice President is the ex-officio Chairman of the Rajya Sabha, which is the upper house of the Indian Parliament.

• The Prime Minister is the head of the Council of Ministers, which is the executive branch of the Indian government.

• The Prime Minister is appointed by the President and is responsible for running the government and implementing its policies.

• The Prime Minister is accountable to the Lok Sabha, which can remove him/her through a vote of no-confidence.

Q98. Answer: (b) 627

Given: (Left) 721, 463, 227, 316, 627 (Right)

If the digit in unit's place of each number is interchanged with the digit in hundred's place of the same number:

Number	Unit's place is interchanged with hundred's place
721	127

463	364
227	722
316	613
627	726

So, the original number '627' will become the largest number as '726'.

The correct answer is "Option 2".

Q99. Answer: (a) 7

Given: (Left) CAR HAT FED EYE (Right)

Now,

the second letter of the first word from the left is: A (CAR)

and, the first letter of the first word from the right is: E (EYE)

Here, the number of letters between A to E is 7.

A	**R**	**H**	**A**	**T**	**F**	**E**	**D**	**E**

Hence, the correct answer is 'Option 1'.

Q100. Answer: (b) 8

Shortcut Trick

Net deviation from the Average score (43) must be zero.

Deviations: (92 − 43) = +49, (53 − 43) = +10, (35 − 43) = −8, (27 − 43) = −16.

Sum of known deviations = 49 + 10 − 8 − 16 = +35.

Score in 4^(th) inning = Average − Sum of known deviations => 43 − 35 = 8.

Therefore The correct answer is 8 runs.

Alternate Method

Given: Runs in 1^(st), 2^(nd), 3^(rd), and 5^(th) innings are 92, 53, 35, and 27 respectively. The Average score for 5 innings is 43.

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

=> Total number of innings = 5

=> Total runs in 5 innings = Average × 5 = 43 × 5 = 215

=> Sum of runs in known 4 innings = 92 + 53 + 35 + 27 = 207

=> Score in 4^(th) inning (x) = Total runs − Sum of known 4 innings

=> x = 215 − 207

=> x = 8

Therefore The correct answer is 8 runs.

Additional Information

Arithmetic Mean

The average or mean is calculated by dividing the sum of values by the total count of values.

Sum Calculation

Total Sum = Average × Number of observations. This is used to find a missing value in a data set.

Average of Consecutive Numbers

For an arithmetic progression, the average is simply (First Term + Last Term) ÷ 2.

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