RRB ALP CBT-I 2024 Official Paper (Held On: 26 Nov, 2024 Shift 3) (Previous Year Paper)

RRB Group D • 2024 • 75 questions • 60 minutes • Answer key and solutions

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STAGE I (CBT I)

Q1. Read the given statements and conclusions carefully. You have to take the given statements to be true even if they seem to be at variance from commonly known facts and decide which conclusion(s) logically follow(s) from the given statements.

Statements:

All engines are rockets.

All planes are rockets.

Conclusions:

(I) Some engines are planes.

(II) All planes are engines.

(a) Only conclusion (II) follows
(b) Both conclusions (I) and (II) follow
(c) Only conclusion (I) follows
(d) Neither conclusion (I) nor (II) follows

Q2. Which of the following options should come in place of the question mark ('?') in the given series based on the English alphabetical order?

FLB,IOE,LRH,OUK,?

(a) RYM
(b) RXN
(c) RYN
(d) RXM

Q3. Which of the following options should come in place of the question mark (?) in the given series to make it logically complete?

24, 26, 30, 36, 44,?

(a) 54
(b) 57
(c) 53
(d) 51

Q4. A textbook has a total of 662 pages. It is divided into two parts. The second part of the book has 52 pages less than the first part. How many pages are there in the first part of the book?

(a) 324
(b) 305
(c) 372
(d) 357

Q5. Under which Section of the Telecommunications Act, 2023, was the Universal Service Obligation Fund renamed as Digital Bharat Nidhi?

(a) Section 24(1)
(b) Section 12(3)
(c) Section 20(1)
(d) Section 30(2)

Q6. RGEL is related to SIHO in a certain way based on the English alphabetical order. In the same way, VOQX is related to WQTA. To which of the following options is YUZG related, following the same logic?

(a) ZWCK
(b) ZYBJ
(c) ZWCJ
(d) ZYCJ

Q7. Select the correct law for the following statement.

During a chemical reaction mass is neither created nor destroyed.

(a) Law of thermodynamic
(b) Henry's Law
(c) Charles Law
(d) Law of conservation of mass

Q8. The relation between thrust (T), pressure (P) and area (A) of an object in a given medium is _____.

(a) T=PxA
(b) TxA=P
(c) T=P+A
(d) T=P/(AxA)

Q9. A dishonest shopkeeper pretends to sell his goods at cost price. However, he uses a false weight on which 984 gm is written, but actually weighs lesser. Using this false weight, the shopkeeper makes a gain of 23%. The actual measure of the weight used is:

(a) 935gm
(b) 800gm
(c) 850gm
(d) 900gm

Q10. The value of (0.000001)^(1/3) is:

(a) 0.1
(b) 0.001
(c) 0.01
(d) 0.000001

Q11. Which of the following is obtained upon heating ferrous sulphate?

(a) Only ferric oxide
(b) Ferric oxide, sulphur dioxide and sulphur trioxide
(c) ferric oxide and sulphur trioxide
(d) ferric oxide and sulphur dioxide

Q12. Which of the following statements is INCORRECT about sodium carbonate?

(a) Sodium carbonate is used in glass, soap and paper industries.
(b) Sodium carbonate is used in the manufacture of sodium compounds, such as borax.
(c) Sodium carbonate is used to neutralise excess acid in the stomach.
(d) Sodium carbonate can be used as a cleaning agent for domestic purposes.

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Q13. Simplify: 3889 + 12.952 - 47.95

(a) 3853.892
(b) 3853.982
(c) 3854.002
(d) 3854.012

Q14. In Fleming's left hand rule, which physical quantity is represented by the middle finger?

(a) Direction of the magnetic field
(b) Direction of electric current
(c) Direction of force
(d) Direction of the motion of conductor

Q15. Seven people, B, C, D, E, F, G, and K, are sitting in a straight line, facing north. Only K sits to the left of G. Only four people sit between K and C. Only E sits between F and D and F is not an immediate neighbour of C.

Who sits at the extreme right of the line?

(a) G
(b) C
(c) B
(d) F

Q16. Which of the following options should come in place of the question mark (?) in the given series based on the English alphabetical order?

HKN, QTW, ZCF, ILO, ?

(a) RUX
(b) RTV
(c) QSU
(d) QTW

Q17. In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Which numbers should replace X and Y so that the pattern followed by the two numbers on the left side of :: is the same as that on the right side of ::?

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

X : 521 :: 794 : Y

(a) X = 698, Y = 612
(b) X = 628, Y = 594
(c) X = 659, Y = 656
(d) X = 674, Y = 588

Q18. Which cell organelle serves as a channel for transport of material between various regions of cytoplasm?

(a) Mitochondria
(b) Lysosomes
(c) Endoplasmic reticulum
(d) Chloroplast

Q19. What was the unemployment rate in India for individuals aged 15 years and above from July 2023 to June 2024?

(a) 3.0%
(b) 3.2%
(c) 3.3%
(d) 3.1%

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Q20. If the radius of a sphere is increased by 50%, find the increase percent in the volume.

(a) 337.5%
(b) 325%
(c) 225%
(d) 237.5%

Q21. Which of the following Indian states hosted the 2023 Hornbill Music Festival?

(a) Kerala
(b) Nagaland
(c) Odisha
(d) Gujarat

Q22. A, B, C, D, E and F are sitting around a circular table facing the centre. A sits second to the left of B. E sits to an immediate left of A. C sits to the immediate right of F. What is the position of C with respect to D?

(a) Immediate right
(b) Second to the left
(c) Second to the right
(d) Third to the left

Q23. The radius of the base and the height of a closed cylinder are in the ratio 1 : 3. Using $\pi = (22/7)$, find its total surface area if its curved surface area is 924 m^2.

(a) 512 m^2
(b) 1848 m^2
(c) 908 m^2
(d) 1232 m^2

Q24. Based on the English alphabetical order, three of the following four letter-clusters are alike in a certain way and thus form a group. Which letter-cluster does not belong to that group?

(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter-cluster.)

(a) OKL
(b) UPR
(c) DYA
(d) LGI

Q25. If a person can see far objects distinctly but cannot see nearby objects clearly, then this eye defect can be corrected by using _____.

(a) a concave lens of suitable power
(b) a plane glass plate
(c) a convex lens of suitable power
(d) a plane mirror

Q26. Which of the following metals are mixed with iron to get stainless steel?

(a) nickel and tin
(b) nickel and zinc
(c) nickel and copper
(d) nickel and chromium.

Q27. Solid CO2 gets converted directly into the gaseous state upon decreasing the pressure to _____.

(a) 2 atmosphere, without coming to the liquid state
(b) 1 atmosphere, without coming to the liquid state
(c) 3 atmosphere, without coming to the liquid state
(d) 4 atmosphere, without coming to the liquid state

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Q28. JHFDA is related to OMKIF in a certain way based on the English alphabetical order. In the same way, NLJHE is related to SQOMJ. To which of the following options is KIGEB related, following the same logic?

(a) PNLJH
(b) PNLJG
(c) QOMKI
(d) QOMKH

Q29. In a row of people, Marshall is sitting 13^(th) from the left end and 36^(th) from the right end. What is the total number of persons in the row?

(a) 49
(b) 46
(c) 48
(d) 50

Q30. Where does the centre of curvature of a concave mirror lie?

(a) At the centre of the mirror
(b) Behind the mirror
(c) At the edge of the mirror
(d) In front of the mirror

Q31. In 2024, which bank partnered with Veefin Solutions to launch the SmartFin, a digital supply-chain finance platform?

(a) HDFC Bank
(b) YES Bank
(c) UCO Bank
(d) ICICI Bank

Q32. What was the score for Goal 1 (No Poverty) in the 2023-24 SDG India Index?

(a) 72
(b) 60
(c) 54
(d) 67

Q33. If 9 lines of a print, in a column of a book, contain 36 words, how many words will a column of 51 lines contain?

(a) 208
(b) 192
(c) 196
(d) 204

Q34. Town A lies to the southwest of Town R. Town D lies to the east of Town A. Town T lies to the southeast of Town D. Town R lies to the north of Town T. Town M lies to the southeast of Town T. What is the position of Town M with respect to Town D?

(a) Northeast
(b) Southeast
(c) Northwest
(d) Southwest

Q35. Two numbers are in the ratio 3 : 2. Their LCM and HCF are 24 and 4, respectively. The greater of the two numbers is:

(a) 10
(b) 8
(c) 12
(d) 14

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Q36. Blood brings carbon dioxide from the rest of the body for release into the:

(a) intestines
(b) oesophaugus
(c) stomach
(d) alveoli

Q37. Which physical quantity represents the rate at which electric energy is dissipated or consumed in an electric circuit?

(a) Electrical energy
(b) Electric power
(c) Potential differrence
(d) Heat energy

Q38. In June 2024, which of the following Indian cities was officially recognised as World Craft City by the World Crafts Council?

(a) Kolkata
(b) Srinagar
(c) New Delhi
(d) Bhopal

Q39. Which of the following organisms reproduces by budding?

(a) Earthworm
(b) Hydra
(c) Frog
(d) Cockroach

Q40. If each letter of the word WELDNG is changed to the letter immediately succeeding it in the English alphabetical order and the new group of letters thus formed is rearranged in English alphabetical order, then which letter is the third from the left in the new rearranged group of letters?

(a) J
(b) E
(c) H
(d) F

Q41. A moving body covers 10 m distance along a straight path in each second. The body is under which type of motion?

(a) Non - uniformly accelerated motion
(b) Uniformly accelerated motion
(c) Circular motion
(d) Uniform motion

Q42. Study the given table and answer the question that follows.

The table depicts new admissions in the Primary and Middle wings of a school in the years 2021 and 2022.

Years	New admission in Primary Wing	New admission in Middle Wing
2021	25	20
2022	12	15

How many new admissions were there in the Primary wing of the school in the years 2021 and 2022 together?

(a) 35
(b) 31
(c) 37
(d) 33

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Q43. A solution contains 40 ml of acid in 120 ml of water. Calculate the concentration in terms of volume by volume percentage of the solution.

(a) 45%
(b) 25%
(c) 12%
(d) 30%

Q44. If a : b = 3 : 4 and b : c = 4 : 1, then a : b : c = ?

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

Q45. The joint exercise involving the Indian Army's Kharga Corps and the Indian Air Force in 2024 was conducted in which state?

(a) Punjab
(b) Rajasthan
(c) Haryana
(d) Gujarat

Q46. Which award has been conferred to Narayan Chakraborty for his contribution in Science and Engineering in 2024?

(a) Bharat Ratna
(b) Padma Shri
(c) Padma Vibhusan
(d) Padma Bhusan

Q47. If each consonant in the word DANCER is changed to the letter immediately preceding it in the English alphabetical order and each vowel is changed to the letter immediately succeeding it in the English alphabetical order, then which of the following letters is repeated twice in the new group of letters thus formed?

(a) Q
(b) B
(c) C
(d) M

Q48. In the word KNIGHT, each consonant is changed to the letter immediately succeeding it in the English alphabetical order and each vowel is changed to the letter immediately preceding it in the English alphabetical order. How many vowels are present in the new group of letters thus formed?

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

Q49. What will come in the place of '?' in the following equation, if '+' and '–' are interchanged and '×' and '÷' are interchanged?

76 ÷ 4 + 108 × 3 – 5 = ?

(a) 273
(b) 265
(c) 275
(d) 271

Q50. For a data, if the mean is 28.5 and the median is 32, then the mode using empirical formula is:

(a) 41
(b) 40
(c) 42
(d) 39

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Q51. The income of X is 60% more than Y's income and the income of Y is 40% more than Z's income. By what percentage is X's income more than Z's income?

(a) 234%
(b) 134%
(c) 224%
(d) 124%

Q52. In this question, a statement is followed by two courses of action, numbered I and II. You must assume everything in the statement to be true and on the basis of the information given in the statement, decide which of the courses of action logically follow(s) for pursuing.

Statement: The price of wheat has been steadily rising across the country since the last 3 weeks, due to shortages reported from major wholesale markets.

Courses of Action: (I) The Government should set up an urgent investigation to check the reasons for the shortages. (II) The Government should provide oil at subsidized rates to citizens till wheat supplies are restored.

(a) Neither I nor II follows
(b) Only I follows
(c) Only II follows
(d) Both I and II follow

Q53. In a certain code language,

A + B means ‘A is the mother of B’,

A – B means ‘A is the brother of B’,

A × B means ‘A is the wife of B’ and

A ÷ B means ‘A is the father of B’.

Based on the above, how is Q related to T if ‘P – Q × R ÷ S + T’?

(a) Mother's brother
(b) Mother
(c) Mother's mother
(d) Daughter

Q54. As of September 2024, who among the following cricketers (men) is India's second highest wicket taker in the Test Matches?

(a) Harbhajan Singh
(b) R Ashwin
(c) Anil Kumble
(d) Kapil Dev

Q55. Reflex arcs are formed in which part of the nervous system?

(a) Medulla
(b) Fore brain
(c) Spinal cord
(d) Cerebellum

Q56. Read the given statements and conclusions carefully. You have to take the given statements to be true even if they seem to be at variance from commonly known facts and decide which conclusion(s) logically follow(s) from the given statements.

Statements:

All clothes are rings.

No cloth is a bottle.

Conclusions:

(I) Some rings are bottles.

(II) Some rings are clothes.

(a) Both conclusions (I) and (II) follow

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(b) Neither conclusion (I) nor (II) follows
(c) Only conclusion (II) follows
(d) Only conclusion (I) follows

Q57. In a certain code language, 'fair weather friend' is coded as 'kl ph gb' and 'best friend ever' is coded as 'ju fv kl'. How is 'friend' coded in the given language?
(a) gb
(b) ph
(c) kl
(d) fv

Q58. If 'A' stands for '÷', 'B' stands for '×', 'C' stands for '+' and 'D' stands for '−', what will come in place of question mark '?' in the following equation?
92 D 12 B 3 C (63 A 3) D 15 =?
(a) 62
(b) 78
(c) 54
(d) 80

Q59. In the following number-pairs, the second number is obtained by applying certain mathematical operations to the first number. Which numbers should replace X and Y so that the pattern followed by the two numbers on the left side of :: is same as that on the right side of ::?
(NOTE: Operations should be performed on the whole numbers, without breaking down the numbers into its constituent digits. E.g. 13 - Operations on 13 such as adding/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed.)
X : 30 :: 175 : Y
(a) X = 195, Y = 27
(b) X = 145, Y = 38
(c) X = 160, Y = 33
(d) X = 180, Y = 44

Q60. As of September 2024, who among the following Indian Cricketers has a record of scoring 6 centuries and 522 wickets in test cricket to his credit?
(a) Ravindra Jadeja
(b) Hardik Pandya
(c) Ravichandra Ashwin
(d) Akshar Patel

Q61. A cyclist covers 2.5 km in 4 minutes 10 seconds. How long will he take to cover 6 km at the same speed?
(a) 12 minutes
(b) 11 minutes
(c) 9 minutes
(d) 10 minutes

Q62. An article is sold for Rs. x after offering two successive discounts of 20% and 15% on its marked price of Rs. 500. The value of x is:
(a) 340
(b) 285
(c) 280
(d) 345

Q63. 8 men and 12 women can build a wall in 10 days. 6 men and 8 women can build the same wall in 14 days. How many more days will 1 woman take to build that wall alone compared to the number of days 1 man will take to build the wall?
(a) 35 days

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(b) 280 days
(c) 70 days
(d) 140 days

Q64. A car moves with a uniform velocity (v) in a particular direction for a distance (s) under the action of a force (F) acting in the same direction. The work done by the force will be:
(a) –Fv
(b) Fs
(c) –Fs
(d) Fv

Q65. Simplify the following expression:
(4.33 × 4.33 - 2.65 × 2.65)/1.68
(a) 6.94
(b) 6.98
(c) 6.99
(d) 6.96

Q66. Two plumbers, X and Y, are paid a total of Rs. 660 per day by their employer. If X is paid 120% of the sum paid to Y, then how much is Y paid per day?
(a) Rs. 200
(b) Rs. 300
(c) Rs. 250
(d) Rs. 350

Q67. Variegated leaves are found in which of the following plants?
(a) Banana
(b) Neem
(c) Croton
(d) Rose

Q68. Burning of naphthalene on a spatula gives a _____.
(a) red flame
(b) clean flame
(c) yellow flame
(d) sooty flame

Q69. In a certain code language, ‘KNEW’ is coded as ‘4682’ and ‘KINE’ is coded as ‘6238’. What is the code for ‘I’ in the given code language?
(a) 6
(b) 3
(c) 2
(d) 8

Q70. Based on the English alphabetical order, three of the following four letter-cluster pairs are alike in a certain way and thus form a group. Which pair does not belong to that group?
(Note: The odd one out is not based on the number of consonants/vowels or their position in the letter cluster.)
(a) LO-MP
(b) SW-UY
(c) TW-UX
(d) CF-DG

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Q71. Simplify the expression: sin A + (cos A)/(tan(90 - A))

(a) 2cosecA
(b) cotA
(c) 2sinA
(d) tan A

Q72. A invests Rs. 8,000 and B invests Rs. 11,000 at the same rate of simple interest per annum. If, at the end of 3 years, B gets Rs. 720 more interest than A, then find the rate of simple interest per annum.

(a) 12%
(b) 10%
(c) 6%
(d) 8%

Q73. Which elements of xylem tissue form interconnected water-conducting channels?

(a) Vessels and Xylem fibres
(b) Tracheids and Xylem fibres
(c) Only Vessels
(d) Vessels and Tracheids

Q74. If a regular polygon has 35 diagonals, then the sum of its interior angles is:

(a) 1620°
(b) 1440°
(c) 1980°
(d) 1800°

Q75. Find the median of the data 11, 16, 33, 15, 51, 19, 71, 75, 21, 17.

(a) 20
(b) 18
(c) 24
(d) 22

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ANSWER KEY

1	d	2	b	3	a	4	d	5	a	6	c	7	d	8	a	9	b	10	c
11	b	12	c	13	c	14	b	15	c	16	a	17	c	18	c	19	b	20	d
21	b	22	d	23	d	24	a	25	c	26	d	27	b	28	b	29	c	30	d
31	b	32	a	33	d	34	b	35	c	36	d	37	b	38	b	39	b	40	c
41	d	42	c	43	b	44	c	45	a	46	b	47	b	48	d	49	a	50	d
51	d	52	b	53	c	54	b	55	c	56	c	57	c	58	a	59	c	60	c
61	d	62	a	63	d	64	b	65	b	66	b	67	c	68	c	69	b	70	b
71	c	72	d	73	d	74	b	75	a										

SOLUTIONS

Q1. Answer: (d) Neither conclusion (I) nor (II) follows

Statements:

All engines are rockets.

All planes are rockets.

The least possible Venn diagram is as follows:

Conclusions:

(I) Some engines are planes. - False (because there is no direct relation between engines and planes so it can be possible but not definite)

(II) All planes are engines. - False (because there is no direct relation between engines and planes so it can be possible but not definite)

Hence, the correct answer is "Neither conclusion (I) nor (II) follows".

Q2. Answer: (b) RXN

The logic followed here is:

Hence, the correct answer is "RXN".

Q3. Answer: (a) 54

The logic followed here is:

Hence, the correct answer is "54".

Q4. Answer: (d) 357

Shortcut Trick

To find the larger value when the sum and difference of two quantities are given:

First Part (Larger) = (Sum + Difference) ÷ 2

=> (662 + 52) ÷ 2

=> 714 ÷ 2 = 357

Therefore The correct answer is 357 pages.

Alternate Method

Given:

Total pages in the book = 662

Difference between First part and Second part = 52

Let the number of pages in the First part be x.

Then, the number of pages in the Second part = x − 52

According to the question:

=> x + (x − 52) = 662

=> 2x − 52 = 662

=> 2x = 662 + 52

=> 2x = 714

=> x = 714 ÷ 2

=> x = 357

Therefore The correct answer is 357 pages.

Additional Information

Sum and Difference Rule

If the sum (S) and difference (D) of two numbers are known, the larger number is (S + D) ÷ 2 and the smaller number is (S − D) ÷ 2.

Linear Equation in One Variable

A relationship where the highest power of the variable is 1, used to find unknown quantities by balancing the total sum.

Percentage Breakdown

To find the percentage share of each part, use (Part ÷ Total) × 100. Here, the First part is (357 ÷ 662) × 100 ≈ 53.9%.

Q5. Answer: (a) Section 24(1)

The correct answer is Section 24(1)

Key Points

• The Universal Service Obligation Fund (USOF) was renamed as Digital Bharat Nidhi (DBN) under Section 24(1) of the

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Telecommunications Act, 2023.

• The USOF was established under the Indian Telegraph Act of 1885.

• The DBN is a fund that supports the delivery of telecommunication services in underserved areas.

• The DBN aims to promote access to telecommunication services for all people at reasonable prices.

Additional Information

• The DBN administrator is responsible for overseeing the implementation and administration of the fund.

• The administrator has the power to:

• Determine funding modalities

• Formulate the procedure for bidding and inviting applications

• Disburse funds to implementers

• Specify terms and conditions related to assets created through DBN funds

Q6. Answer: (c) ZWCJ

The logic followed here is:

RGEL is related to SIHO

VOQX is related to WQTA

Similarly, YUZG will be related:

Hence, the correct answer is "ZWCJ".

Q7. Answer: (d) Law of conservation of mass

The correct answer is Law of conservation of mass.

Key Points

• The Law of Conservation of Mass states that mass is neither created nor destroyed in a chemical reaction.

• This law was formulated by Antoine Lavoisier in 1789.

• It is a fundamental principle of classical physics and chemistry.

• During a chemical reaction, the total mass of the reactants is equal to the total mass of the products.

• This law is essential for balancing chemical equations and understanding stoichiometry.

Additional Information

• Law of Thermodynamics

• It comprises four laws that describe the relationships between heat, work, temperature, and energy.

• These laws are fundamental for understanding the physical properties of matter and the behavior of energy in different systems.

• Henry's Law

• This law states that the amount of gas that dissolves in a liquid is directly proportional to the partial pressure of that gas above the liquid.

• It is used in various applications, including calculating the solubility of gases in liquids under different conditions.

• Charles' Law

• This law states that the volume of a gas is directly proportional to its temperature, provided the pressure remains constant.

• It is a part of the ideal gas law and is essential for understanding the behavior of gases under varying temperature conditions.

Q8. Answer: (a) T=PxA

The correct answer is Option 1: T = P x A.

Key Points

• Thrust (T) is a force exerted by the pressure (P) acting over a specific area (A).

• The formula for thrust is given by the product of pressure and area: T = P x A.

• This relationship indicates that thrust increases with an increase in either pressure or area.

• Pressure is defined as the force per unit area, and when multiplied by area, it gives the total force or thrust.

• Understanding this relationship is crucial in fields such as fluid dynamics and aerodynamics, where pressure and thrust play a significant role.

Additional Information

• Fluid Dynamics

• It is the study of the movement of liquids and gases and their interactions with solid boundaries.

• Understanding the principles of fluid dynamics is essential for designing efficient systems in engineering and natural sciences.

• Aerodynamics

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• Aerodynamics is the study of the behavior of air as it interacts with solid objects, such as an aircraft wing.

• It involves the application of fluid dynamics principles to understand and predict the forces and moments acting on bodies in motion through the air.

• Pressure Measurement

• Pressure is measured using instruments like manometers, barometers, and pressure transducers.

• Accurate measurement of pressure is vital in various industrial and scientific applications to ensure system efficiency and safety.

Q9. Answer: (b) 800gm

Shortcut Trick

A gain of 23% implies that the ratio of Actual weight to False weight is 100 : 123.

Given False weight (Written weight) = 984 gm.

=> 123 units = 984 gm

=> 1 unit = 984 ÷ 123 = 8 gm

=> Actual weight = 100 units = 100 × 8 = 800 gm

Therefore The correct answer is 800gm.

Alternate Method

Given:

Written weight (True Value) = 984 gm

Gain percentage = 23%

Formula Used:

Gain % = [(Written Weight − Actual Weight) ÷ Actual Weight] × 100

Let the Actual weight be x gm.

=> 23 = [(984 − x) ÷ x] × 100

=> 0.23x = 984 − x

=> x + 0.23x = 984

=> 1.23x = 984

=> x = 984 ÷ 1.23

=> x = 98400 ÷ 123

=> x = 800 gm

Therefore The correct answer is 800gm.

Additional Information

Dishonest Dealer Concept

When a dealer sells goods at Cost Price but uses a false weight, the profit percentage is calculated as: (Error ÷ Actual Weight) × 100.

Weight-Price Relation

The Selling Price is proportional to the False weight written on the scale, while the Cost Price is proportional to the Actual weight delivered.

Combined Profit

If a dealer also marks up the price by k% and uses a false weight, the Overall Profit is calculated by multiplying the respective ratios: (1 + k/100) × (True Weight ÷ Actual Weight).

Q10. Answer: (c) 0.01

Given:

(0.000001)^(1/3)

Formula used:

$(a^m)^n = a^{(m \cdot n)}$

Calculation:

=> (0.000001)^(1/3) = (10^(-6))^(1/3)

=> (10^(-6))^(1/3) = 10^(-6/3)

=> (10^(-2)) = 0.01

Therefore The value of (0.000001)^(1/3) = 0.01.

Q11. Answer: (b) Ferric oxide, sulphur dioxide and sulphur trioxide

The correct answer is Ferric oxide, sulphur dioxide and sulphur trioxide.

Key Points

• Upon heating, ferrous sulphate decomposes to form ferric oxide, sulphur dioxide, and sulphur trioxide.

• The chemical reaction involved is: 2 FeSO4 (s) → Fe2O3 (s) + SO2 (g) + SO3 (g).

• This is an example of a thermal decomposition reaction where a compound breaks down into simpler substances when heated.

• Ferric oxide is a solid, while sulphur dioxide and sulphur trioxide are gases.

• Sulphur dioxide and sulphur trioxide are acidic oxides that can contribute to acid rain when released into the atmosphere.

Additional Information

• Thermal Decomposition

• It is a chemical reaction where a chemical compound breaks down into simpler substances when heated.

• Thermal decomposition reactions are usually endothermic, meaning they absorb heat.

• Sulphur Dioxide (SO2)

• It is a colorless gas with a pungent odor, used in the production of sulfuric acid and as a preservative.

• SO2 can cause respiratory problems and is a major air pollutant.

• Sulphur Trioxide (SO3)

• It is a highly reactive substance used in the production of sulfuric acid.

• SO3 can form a mist in the air and contribute to environmental pollution.

Q12. Answer: (c) Sodium carbonate is used to neutralise excess acid in the stomach.

The correct answer is option 3.

Key Points

• Sodium carbonate(Na2Co3), also known as soda ash or washing soda, is widely used in the glass, soap, and paper industries.

• It is utilized in the manufacture of various sodium compounds, such as borax.

• Sodium carbonate is not typically used to neutralize excess acid in the stomach; this role is usually fulfilled by sodium bicarbonate.

• It can be used as a cleaning agent for domestic purposes, such as removing grease and oil stains.

Additional Information

• Sodium Bicarbonate

• Commonly known as baking soda, it is used to neutralize stomach acid and relieve heartburn and indigestion.

• It is also used in baking as a leavening agent.

• Sodium Hydroxide

• Also known as caustic soda, it is used in the manufacture of soaps, paper, and various chemicals.

• It is a strong base and can cause severe chemical burns.

• Calcium Carbonate

• This compound is used as a dietary calcium supplement and as an antacid to relieve heartburn and indigestion.

• It is also used in the construction industry as a building material and in the production of lime and cement.

Q13. Answer: (c) 3854.002

Given:

Expression: 3889 + 12.952 - 47.95

Formula Used:

Simplification of the arithmetic expression.

Calculation:

First, perform the addition:

3889 + 12.952

=> 3901.952

Next, subtract 47.95 from the result:

3901.952 - 47.95

=> 3854.002

The correct answer is option 3.

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Q14. Answer: (b) Direction of electric current

The correct answer is Direction of electric current.

Key Points

• Fleming's left-hand rule is used to determine the direction of force experienced by a current-carrying conductor in a magnetic field.

• According to Fleming's left-hand rule, the thumb represents the direction of the force or motion.

• The first finger (index finger) represents the direction of the magnetic field.

• The middle finger represents the direction of the electric current.

• This rule is particularly useful in electric motors to find the direction of force acting on the armature.

Additional Information

• Fleming's Right-Hand Rule

• This rule is used to determine the direction of induced current when a conductor moves in a magnetic field.

• According to this rule, the thumb points in the direction of motion of the conductor, the first finger in the direction of the magnetic field, and the middle finger gives the direction of the induced current.

• Electric Motors

• Electric motors work on the principle of electromagnetic induction, which involves the interaction of magnetic fields and electric currents to produce motion.

• Fleming's left-hand rule helps in understanding the operation of electric motors by determining the direction of force on the motor's armature.

• Electromagnetic Induction

• This is the process of generating electric current in a conductor by changing the magnetic field around it.

• Faraday's laws of electromagnetic induction describe how a change in magnetic field can induce an electromotive force (EMF) in a conductor.

Q15. Answer: (c) B

Given: Seven people, B, C, D, E, F, G, and K, are sitting in a straight line, facing north.

1) Only K sits to the left of G.

2) Only four people sit between K and C.

3) Only E sits between F and D and F is not an immediate neighbour of C.

After positioning E, F and D only one position is left which will be occupied by the only person left i.e. B.

Thus, according to the final arrangement, B sits at the extreme right of the line.

Hence, "Option 3" is the correct answer.

Q16. Answer: (a) RUX

The logic followed here is:

Hence, "Option 2" is the correct answer.

Q17. Answer: (c) X = 659, Y = 656

The logic followed here is:

Given: X : 521 :: 794 : Y

So, replacing 'X' and 'Y' in each option one by one:

Option 1) X = 698, Y = 612 => 698 : 521 :: 794 : 612

698 - 521 = 794 - 612

177 ≠ 182 (LHS ≠ RHS)

Option 2) X = 628, Y = 594 => 628 : 521 :: 794 : 628

628 - 521 = 794 - 628

107 ≠ 166 (LHS ≠ RHS)

Option 3) X = 659, Y = 656 => 659 : 521 :: 794 : 656

659 - 521 = 794 - 656

138 = 138 (LHS = RHS)

Option 4) X = 674, Y = 588 => 674 : 521 :: 794 : 588

674 - 521 = 794 - 588

153 ≠ 206 (LHS ≠ RHS)

Hence, "Option 3" is the correct answer.

Q18. Answer: (c) Endoplasmic reticulum

The correct answer is Endoplasmic reticulum.

Key Points

• The endoplasmic reticulum (ER) serves as a channel for the transport of materials between various regions of the cytoplasm.

• The ER is an extensive network of membranes found throughout the cytoplasm of eukaryotic cells.

• It is divided into two regions: the rough ER (which has ribosomes attached to its surface) and the smooth ER (which lacks ribosomes).

• The rough ER is primarily involved in the synthesis and processing of proteins, while the smooth ER is involved in lipid synthesis and detoxification.

• The ER is crucial for the transport and modification of proteins that are either secreted by the cell or incorporated into the cell membrane.

Additional Information

• Mitochondria

• Known as the powerhouses of the cell, they generate most of the cell's supply of ATP, used as a source of chemical energy.

• They have a double-membrane structure and their own DNA and ribosomes.

• Lysosomes

• These membrane-bound organelles contain enzymes responsible for breaking down waste materials and cellular debris.

• Referred to as the "digestive system" of the cell, they help degrade macromolecules.

• Chloroplast

• These organelles are found in plant cells and eukaryotic algae and conduct photosynthesis.

• They capture light energy and convert it into chemical energy in the form of glucose through photosynthesis.

Q19. Answer: (b) 3.2%

The correct answer is 3,2%

Key Points

• The unemployment rate in India for people aged 15 and above from July 2023 to June 2024 was 3.2%.

• This rate remained unchanged from the previous year, despite a five-year decline.

• The unemployment rate is the percentage of people in the labor force who are unemployed.

• The Periodic Labour Force Survey (PLFS) is the source of this data.

• The PLFS for the period July 2023 to June 2024 was released by the Labour Bureau on September 23, 2024.

Additional Information

• Unemployment rate in India

• In March 2022, the unemployment rate in India was 8.28% in urban areas.

• In January 2023, the unemployment rate in India was 7.14%.

• In January 2022, the unemployment rate in India was 6.57%.

• In December 2022, the unemployment rate in India was 8.3%

Q20. Answer: (d) 237.5%

Shortcut Trick

Radius increase = 50% → 1/2 (Ratio = 2 : 3)

Volume of a sphere is proportional to the cube of its radius (r^3).

Initial Volume Ratio : Final Volume Ratio = $2^3 : 3^3 = 8 : 27$

Increase in Volume = 27 − 8 = 19 units

Percentage Increase = (19 ÷ 8) × 100 = 2.375 × 100 = 237.5%

Therefore The correct answer is 237.5%.

Alternate Method

Given:

Increase in radius (r) = 50%

Formula Used:

Volume of sphere (V) = (4/3) × π × r^3

Percentage increase = [(New Volume − Old Volume) ÷ Old Volume] × 100

Calculations:

Let the initial radius be r = 100 units.

=> Initial Volume (V1) = (4/3) × π × $(100)^3$

New radius (r') = 100 + 50% of 100 = 150 units.

=> New Volume (V2) = (4/3) × π × $(150)^3$

=> Volume increase = V2 − V1 = (4/3) × π × (150^3 − 100^3)

=> % Increase = [((4/3) × π × (3375000 − 1000000)) ÷ ((4/3) × π × 1000000)] × 100

=> % Increase = (2375000 ÷ 1000000) × 100

=> % Increase = 2.375 × 100 = 237.5%

Therefore The correct answer is 237.5%.

Additional Information

Surface Area Change

If the radius of a sphere increases by x%, the Surface Area ($4\pi r^2$) increases by [$2x + (x^2/100)$]%.

Successive Percentage Rule

For volume, since it depends on r^3, we apply the successive percentage formula three times or use the multiplier $(1 + x/100)^3$.

Sphere Properties

A sphere is a perfectly round geometrical object in 3D space. Volume = $(4/3)\pi r^3$ and Surface Area = $4\pi r^2$.

Q21. Answer: (b) Nagaland

The correct answer is Nagaland

Key Points

• The Hornbill Festival is celebrated in the state of Nagaland.

• Nagaland hosted the 2023 Hornbill Music Festival

• It is named after the Indian Hornbill, a large and colorful forest bird which is displayed in the folklore of most of the state's tribes.

• The festival is held every year in the first week of December.

• The festival aims to revive and protect the rich culture of Nagaland and display its extravaganza and traditions.

• It is also known as the 'Festival of Festivals' and is organized by the State Tourism and Art & Culture Departments.

Additional Information

• Nagaland is a state in Northeast India.

• The capital of Nagaland is Kohima, and its largest city is Dimapur.

• The state is known for its indigenous tribes, each with distinct festivals, customs, and traditions.

• The Hornbill Festival provides a unique opportunity to experience the customs, songs, dances, and food of Nagaland.

• The festival also includes various events such as traditional Naga Morungs exhibition, sale of arts and crafts, food stalls, herbal medicine stalls, fashion shows, beauty contest, traditional archery, Naga wrestling, and musical concerts.

Q22. Answer: (d) Third to the left

Given: A, B, C, D, E and F are sitting around a circular table facing the centre.

1) A sits second to the left of B.

2) E sits to an immediate left of A.

3) C sits to the immediate right of F.

After positioning C and F only one position is left which will be occupied by the only person left i.e. D.

Thus, according to the final arrangement, C sits third to the left of D.

Hence, "Option 4" is the correct answer.

Q23. Answer: (d) 1232 m^2

Shortcut Trick

Ratio of radius (r) to height (h) = 1 : 3.

Direct relationship: TSA / CSA = (r + h) / h.

Substituting the ratios: TSA / 924 = (1 + 3) / 3 = 4 / 3.

TSA = 924 × (4 / 3) = 308 × 4 = 1232 m^2.

Therefore The correct answer is 1232 m^2.

Alternate Method

Given:

Ratio of radius (r) to height (h) = 1 : 3

Curved Surface Area (CSA) = 924 m^2

Formula Used:

CSA of cylinder = 2πrh

Total Surface Area (TSA) of cylinder = 2πr(h + r)

Calculations:

Let radius (r) = x and height (h) = 3x

=> CSA = 2 × (22/7) × x × 3x = 924

=> (132 / 7) × x^2 = 924

=> x^2 = (924 × 7) / 132

=> x^2 = 7 × 7 = 49

=> x = 7 m

=> radius (r) = 7 m and height (h) = 3 × 7 = 21 m

=> TSA = 2 × (22/7) × 7 × (21 + 7)

=> TSA = 44 × 28

=> TSA = 1232 m^2

Therefore The correct answer is 1232 m^2.

Additional Information

Volume of a Cylinder

The volume represents the capacity and is calculated as V = $\pi r^2 h$.

Total Surface Area Components

For a closed cylinder, TSA = CSA + 2 × Base Area = $2\pi rh + 2\pi r^2$.

Ratio Property

If the ratio of r:h is known, the ratio of TSA:CSA is always (r+h):h, which is independent of the actual dimensions.

Q24. Answer: (a) OKL

The logic followed here is:

Option 1) OKL

Option 2) UPR

Option 3) DYA

Option 4) LGI

Thus, out of all the options, 'OKL' is the odd one out.

Hence, "Option 1" is the correct answer.

Q25. Answer: (c) a convex lens of suitable power

The correct answer is a convex lens of suitable power.

Key Points

• The condition where a person can see distant objects clearly but has difficulty seeing nearby objects is called hypermetropia or farsightedness.

• Hypermetropia occurs when the eyeball is too short or the lens is not curved enough, causing light to focus behind the retina.

• This condition can be corrected by using a convex lens of suitable power.

• A convex lens converges light rays before they enter the eye, thus allowing the light to focus directly on the retina.

• Using a convex lens helps in adjusting the focal length so that nearby objects can be seen clearly.

Additional Information

• Myopia

• Myopia, or nearsightedness, is a condition where a person can see nearby objects clearly but has difficulty seeing distant objects.

• It is usually corrected using concave lenses, which diverge light rays before they enter the eye.

• Astigmatism

• Astigmatism is a common vision condition caused by an irregularly shaped cornea or lens.

• It can cause blurred or distorted vision at all distances and is usually corrected with cylindrical lenses.

• Presbyopia

• Presbyopia is an age-related condition where the eye's lens loses its flexibility, making it difficult to focus on close objects.

• This condition can be corrected using bifocal or progressive lenses that have different sections for distance and near vision.

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Q26. Answer: (d) nickel and chromium.

The correct answer is nickel and chromium.

Key Points

• Stainless steel is primarily made by mixing iron with chromium and nickel to enhance its properties.

• Chromium is added to stainless steel to improve its corrosion resistance and to create a passive layer that prevents rust.

• Nickel is added to increase the toughness and strength of stainless steel, especially at low temperatures.

• Stainless steel is widely used in various applications due to its durability, resistance to corrosion, and aesthetic appearance.

Additional Information

• Types of Stainless Steel

• There are different types of stainless steel, including austenitic, ferritic, martensitic, and duplex, each with unique properties and applications.

• Austenitic stainless steel is the most common type, known for its excellent corrosion resistance and formability.

• Applications of Stainless Steel

• Stainless steel is used in a wide range of industries, including construction, automotive, medical, and food processing.

• Its resistance to corrosion makes it ideal for kitchen appliances, cutlery, and surgical instruments.

• Maintenance of Stainless Steel

• Regular cleaning and maintenance can help preserve the appearance and longevity of stainless steel products.

• Using mild detergents and avoiding abrasive cleaners will prevent damage to the passive layer of stainless steel.

Q27. Answer: (b) 1 atmosphere, without coming to the liquid state

The correct answer is 1 atmosphere, without coming to the liquid state.

Key Points

• Solid carbon dioxide (CO_2) is commonly known as dry ice.

• Dry ice sublimates, meaning it changes directly from a solid to a gas without passing through the liquid state.

• This sublimation occurs at atmospheric pressure, which is approximately 1 atmosphere.

• The temperature at which dry ice sublimates is -78.5 degrees Celsius.

• Decreasing the pressure around dry ice further enhances the sublimation process.

Additional Information

• Uses of Dry Ice

• Dry ice is used for refrigeration, especially for shipping perishable goods.

• It is also used in fog machines to create dense, low-lying fog effects.

• Safety Precautions

• Handling dry ice requires protective gloves, as it can cause severe frostbite.

• It should be used in well-ventilated areas to prevent the buildup of CO_2 gas, which can be dangerous.

• Storage and Handling

• Dry ice should be stored in insulated containers to slow down the sublimation process.

• It should never be stored in airtight containers, as the pressure buildup from sublimating CO_2 can cause the container to burst.

Q28. Answer: (b) PNLJG

The logic followed here is:

JHFDA is related to OMKIF

And,

NLJHE is related to SQOMJ

Similarly,

KIGEB is related to

Hence, "Option 2" is the correct answer.

Q29. Answer: (c) 48

The logic followed here is:

Position of Marshall from the left = 13th

Position of Marshall from the right = 36th

So,

Total number of people = Position of Marshall from the left + Position of Marshall from the right - 1
= 13 + 36 - 1
= 49 - 1 = 48.
Hence, the correct answer is "Option 3".

Q30. Answer: (d) In front of the mirror

The correct answer is In front of the mirror.
Key Points
• The centre of curvature of a concave mirror is the point on the principal axis at which the reflected rays converge.
• This point lies at a distance equal to the radius of curvature from the mirror's surface.
• It is denoted by the letter 'C' in ray diagrams.
• Since the concave mirror converges light, the centre of curvature is located in front of the mirror.
• It is a real point and can be used to determine the focal length of the mirror, which is half the radius of curvature.
Additional Information
• Concave Mirrors
• These are mirrors with a surface that curves inward like a cave, often used in telescopes and shaving mirrors.
• They form real, inverted images when the object is placed beyond the focal point.
• Convex Mirrors
• These mirrors have a surface that curves outward, used in vehicle side mirrors for a wider field of view.
• They always form virtual, erect, and diminished images regardless of the object's position.
• Focal Point
• The focal point of a concave mirror is the point where parallel rays converge after reflecting off the mirror.
• It is located halfway between the mirror's surface and its centre of curvature.

Q31. Answer: (b) YES Bank

The correct answer is YES Bank
Key Points
• Yes Bank partnered with Veefin Solutions to launch SmartFin in 2024.
• SmartFin is a digital supply chain finance (SCF) platform that helps support Micro, Small, and Medium Enterprises (MSMEs).
• Benefits of SmartFin Helps MSMEs achieve their business objectives
• It Helps drive working capital efficiencies
• It Helps drive operational and financial efficiencies, and Helps strengthen supply chain partnerships
Additional Information

Bank	HDFC Bank	UCO Bank	ICICI Bank
Founded	1994	1943	1955
Headquarters	Mumbai	Kolkata	Mumbai
Assets	Rs. 17.62 lakh crore	Rs. 5.10 lakh crore	Rs. 14.82 lakh crore
Customers	Over 160 million	Over 130 million	Over 115 million
Branches	Over 5,600 branches	Over 3,000 branches	Over 5,300 branches
Products	Retail & Corporate Banking	Retail, SME, Corporate	Retail, Corporate Banking
Net Profit	Rs. 16,094 crore (FY 2023)	Rs. 1,509 crore (FY 2023)	Rs. 9,221 crore (FY 2023)

Q32. Answer: (a) 72

The correct answer is 72
Key Points
• The score for Goal 1 (No Poverty) in the 2023-24 SDG India Index was 72.
• This was an improvement from 60 in the 2020-21 index.
• The SDG India Index is a report that measures India's progress towards achieving the Sustainable Development Goals (SDGs).
• The index is compiled by NITI Aayog.
Additional Information

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• The index scores states and union territories (UTs) on a scale of 0 to 100 for each indicator.

• The overall score for each state or UT is the sum of the scores for all 17 SDGs.

• The index categorizes states and UTs into four groups based on their scores: Achievers, Front-Runners, Performers, and Aspirants.

Q33. Answer: (d) 204

Shortcut Trick

Identify the relationship: More lines will contain more words (Direct Proportion).

Apply the Unitary Method logic directly: (Value ÷ Quantity) × New Quantity

Calculation: (36 ÷ 9) × 51

=> 4 × 51 = 204

Therefore The correct answer is 204 words.

Alternate Method

Given:

Words in 9 lines = 36

Total lines to calculate for = 51 lines

Formula Used:

Words per line = Total words ÷ Number of lines

Total words = (Words per line) × (Number of lines)

Calculations:

=> Words in 1 line = 36 ÷ 9

=> Words in 1 line = 4 words

=> Words in 51 lines = 51 × 4

=> Words in 51 lines = 204 words

Therefore, the value is 204, which corresponds to Option (4).

Therefore The correct answer is 204 words.

Additional Information

Direct Proportion

When two quantities increase or decrease together at the same rate, they are in Direct Proportion. Formula: x1/y1 = x2/y2.

Unitary Method

A technique for solving problems by first finding the value of a single unit, and then finding the necessary value by multiplying the single unit value.

Inverse Proportion

When an increase in one quantity results in a decrease in another, they are in Inverse Proportion. Formula: x1 × y1 = x2 × y2.

Q34. Answer: (b) Southeast

Given:

Town A lies to the southwest of Town R.

Town D lies to the east of Town A.

Town T lies to the southeast of Town D.

Town R lies to the north of Town T.

Town M lies to the southeast of Town T.

Thus, Town M lies to the southeast of Town D.

Hence, "Option 2" is the correct answer.

Q35. Answer: (c) 12

Shortcut Trick

When the ratio of two numbers is a : b and their HCF is H, the numbers are a × H and b × H.

Given Ratio = 3 : 2 and HCF = 4.

Greater number = 3 × 4 = 12.

Smaller number = 2 × 4 = 8.

Verification: LCM of 12 and 8 is 24, which matches the given data.

Therefore The correct answer is 12.

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Alternate Method

Given: Ratio = 3 : 2, LCM = 24, HCF = 4.

Formula: Product of two numbers = HCF × LCM

=> Let the two numbers be 3x and 2x.

=> The HCF of 3x and 2x is x (since 3 and 2 are co-prime).

=> Given HCF = 4, so x = 4.

=> Number 1 = 3x = 3 × 4 = 12.

=> Number 2 = 2x = 2 × 4 = 8.

=> Comparing the two numbers, 12 is greater than 8.

Therefore The correct answer is 12.

Additional Information

Fundamental Property of HCF and LCM

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

Ratio and LCM Relationship

If two numbers are in the ratio x : y and their HCF is H, then their LCM = x × y × H.

Co-prime Numbers

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

Q36. Answer: (d) alveoli

The correct answer is alveoli.

Key Points

• Alveoli are tiny air sacs in the lungs where the exchange of oxygen and carbon dioxide takes place.

• They are located at the end of the respiratory tree and are the primary sites for gas exchange in the respiratory system.

• The walls of alveoli are extremely thin, allowing for efficient diffusion of gases between the air and the blood.

• Alveoli are surrounded by a network of capillaries, which facilitate the transfer of oxygen into the blood and carbon dioxide out of the blood.

• Each lung contains millions of alveoli, providing a large surface area for gas exchange to meet the body's needs.

Additional Information

• Bronchi

• The bronchi are the main passageways that lead from the trachea to the lungs and branch into smaller tubes called bronchioles.

• They help carry air to and from the alveoli.

• Diaphragm

• The diaphragm is a dome-shaped muscle located below the lungs that plays a crucial role in breathing.

• When the diaphragm contracts, it creates a vacuum that allows air to enter the lungs.

• Capillaries

• Capillaries are small blood vessels where the exchange of oxygen, carbon dioxide, nutrients, and waste products occurs between the blood and tissues.

• They are essential for supplying oxygen and nutrients to tissues and removing waste products.

Q37. Answer: (b) Electric power

The correct answer is Electric Power.

Key Points

• Electric power is the rate at which electric energy is dissipated or consumed in an electric circuit.

• The formula to calculate electric power is P = VI, where P represents power, V is the potential difference, and I is the current.

• It can also be expressed as P = I^2R or P = V^2/R, depending on the known parameters in the circuit.

• It is measured in watts (W), where 1 watt is equivalent to 1 joule of energy consumed per second.

• Electric power is essential in determining the efficiency and energy usage of electrical devices and systems.

• Devices with higher power ratings consume more energy and perform more work in less time, such as heaters, motors, and lights.

• Practical applications of electric power include household appliances, industrial machinery, and power distribution networks.

Additional Information

• Electrical Energy

• Electrical energy refers to the total energy transferred by an electric circuit during a specific period.

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• It is measured in joules (J) or kilowatt-hours (kWh).
• It is related to electric power by the equation E = P × t, where E is energy, P is power, and t is time.
• Potential Difference
• Potential difference is the difference in electric potential between two points in a circuit.
• It is measured in volts (V) and is also known as voltage.
• It determines the energy per unit charge that drives current through a circuit.
• Heat Energy
• Heat energy is the energy transferred due to the temperature difference in a system.
• In an electric circuit, heat energy is produced due to the Joule heating effect, where electric current passes through a resistor.
• It is given by the formula H = I²Rt, where H is heat energy, I is current, R is resistance, and t is time.

Q38. Answer: (b) Srinagar

The correct answer is Srinagar

Key Points

• Srinagar was officially recognized as a World Craft City by the World Crafts Council (WCC) in June 2024.
• It is the fourth Indian city to receive this recognition.
• The WCC works to protect heritage and support artisans globally.
• Srinagar is known for its rich cultural heritage, including its traditional arts and crafts.
• The recognition is seen as a way for Kashmir to reconnect with craft centers in Central Asia and Iran.
• Other Indian cities that have been recognized as World Craft Cities include: Jaipur, Malappuram, and Mysore.

Additional Information

• objectives of the World Crafts Council
• Promote fellowship among craftspeople
• Encourage and advise artisans
• Foster economic development through craft-related activities
• Promote cultural exchange through conferences, workshops, and exhibitions
• Increase recognition of craftspeople's work

Q39. Answer: (b) Hydra

The correct answer is Hydra.

Key Points

• Hydra is a genus of small, fresh-water organisms that belong to the phylum Cnidaria.
• Reproduction in Hydra occurs through a process called budding, where a new individual develops from an outgrowth or bud due to cell division at one particular site.
• The bud initially remains attached to the parent organism and then detaches to become an independent organism.
• Budding is an asexual mode of reproduction, allowing for rapid population growth under favorable conditions.
• Hydra can also reproduce sexually, but budding is the most common and frequent mode of reproduction in these organisms.

Additional Information

• Earthworm
• Earthworms reproduce sexually through a process called copulation, where two worms exchange sperm.
• They are hermaphrodites, meaning each individual possesses both male and female reproductive organs.
• Frog
• Frogs reproduce sexually with external fertilization, where the female lays eggs and the male fertilizes them outside her body.
• Frogs undergo a complex life cycle including egg, tadpole, and adult stages.
• Cockroach
• Cockroaches reproduce sexually with internal fertilization, where the male deposits sperm inside the female's body.
• They lay eggs in protective cases called oothecae, which hatch into nymphs that undergo several molts before becoming adults.

Q40. Answer: (c) H

The logic follows here is :-

Given word : WELDNG

Step 1: Change each letter to the letter immediately succeeding it in the English alphabetical order:

Step 2: Rearrange these letters in English alphabetical order:

Word	W	E	L	D	N	G
Immediate Succeeding Letter	X	F	M	E	O	H
Alphabetical Order	E	F	H	M	O	X

The third letter from the left is: H

Hence, the correct answer is "Option 3".

Q41. Answer: (d) Uniform motion

The correct answer is Uniform motion.

Key Points

• In uniform motion, a body covers equal distances in equal intervals of time.
• The velocity of the body remains constant throughout the motion.
• There is no acceleration in uniform motion as the speed does not change.
• Examples of uniform motion include a car moving at a constant speed on a straight road.
• This type of motion is different from accelerated motion, where the speed of the body changes over time.

Additional Information

• Non-Uniformly Accelerated Motion
• In this type of motion, the velocity of the body changes at a non-constant rate.
• Examples include a car accelerating at varying rates.
• Uniformly Accelerated Motion
• The velocity of the body changes at a constant rate.
• An example is a freely falling object under gravity.
• Circular Motion
• In circular motion, a body moves along a circular path.
• The velocity direction changes continuously, even if the speed remains constant.

Q42. Answer: (c) 37

Formula used:

Total new admissions in Primary Wing = Admissions in 2021 + Admissions in 2022

Calculation:

Total admissions in Primary Wing = 25 + 12

=> Total = 37

Therefore The total new admissions in the Primary wing for 2021 and 2022 is 37.

Q43. Answer: (b) 25%

The correct answer is 0.25.

Key Points

• Volume by volume percentage is calculated using the formula: (Volume of solute)/(Total volume of solution) × 100.
• Here, the volume of the solute (acid) is 40 ml.
• The total volume of the solution is the sum of the volume of the solute and the solvent: 40 ml + 120 ml = 160 ml.
• Using the formula: (40 ml)/(160 ml) × 100 = 25%.
• The concentration in terms of volume by volume percentage of the solution is 0.25 or 25%.

Additional Information

• Concentration units
• Concentration can be expressed in various units such as molarity, molality, mass by volume percentage, and volume by volume percentage.
• Applications of concentration
• Concentration is a critical factor in chemical reactions, pharmaceuticals, and solutions in various industries.
• Importance of accurate measurements
• Accurate measurements of solute and solvent volumes are essential for precise concentration calculations.

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Q44. Answer: (c) 3 : 4 : 1

Shortcut Trick

When the common term 'b' is identical in both the given ratios, we can write the combined ratio directly without any cross-multiplication.

Given a : b = 3 : 4 and b : c = 4 : 1.

Since the value of b is exactly 4 in both parts, we just merge the corresponding values of a, b, and c side by side.

=> a : b : c = 3 : 4 : 1.

Therefore The correct answer is 3 : 4 : 1.

Alternate Method

Given:

Ratio of a : b = 3 : 4

Ratio of b : c = 4 : 1

Calculations:

=> In the ratio a : b, the value representing b is 4 units.

=> In the ratio b : c, the value representing b is also 4 units.

=> Since the common linking variable 'b' has an identical value in both ratios, no further multiplication or scaling is required.

=> We can directly extract and equate the combined values of a, b, and c relative to each other.

=> a = 3, b = 4, c = 1

=> a : b : c = 3 : 4 : 1

Therefore The correct answer is 3 : 4 : 1.

Additional Information

Inverted 'N' Method for Combining Ratios

If a : b = p : q and b : c = x : y, then a : b : c = (p × x) : (q × x) : (q × y). This trick is helpful when the middle term 'b' is completely different in both cases and needs to be equalised.

Proportion Rule

Four numbers a, b, c, and d are said to be in proportion if a : b = c : d. A very important mathematical property here is that the product of the extremes equals the product of the means: a × d = b × c.

Duplicate & Triplicate Ratios

The duplicate ratio of a : b is given by $a^2 : b^2$, and the triplicate ratio of a : b is given by $a^3 : b^3$. Conversely, the sub-duplicate ratio is written as √a : √b.

Q45. Answer: (a) Punjab

The correct answer is Punjab

Key Points

• The joint exercise between the Indian Army's Kharga Corps and the Indian Air Force (IAF) in 2024 was conducted in Punjab.

• The exercise was named "Gagan Strike-II".

• The exercise was designed to validate the use of attack helicopters in mechanized operations.

• It also aimed to improve operational preparedness and the use of assets to support ground offensive campaigns.

• The exercise involved live firing by helicopters, practicing attack helicopter missions, and engaging targets in the battlefield

Additional Information Indian Airforce:

• It was established in October 1932.

• It is one of the parts of the Indian Armed forces, the others being the Indian Army and Indian Navy.

• The President of India is the Supreme Commander of the IAF.

• The Indian Airforce is the Fourth largest Airforce in the world in terms of both personnel and aircraft.

• Arjan Singh was the first five-star rank-holding officer in IAF.

• Subroto Mukherjee was the first Chief of the Air Staff of the Indian Airforce.

• Subroto Mukherjee is also known as the Father of the Indian Air Force.

Q46. Answer: (b) Padma Shri

The correct answer is Padma Shri

Key Points

• Narayan Chakraborty was awarded the Padma Shri in 2024 for his contributions to science and engineering.

• The Padma Shri is one of the three categories of the Padma Awards, which are given annually by the President of India.

• This recognition highlights his significant impact on advancing scientific knowledge and innovation in India.

Additional Information

• The Padma Awards are given to recognize exceptional achievements in various fields, including science, engineering, arts, literature, and more.

• The three categories of the Padma Awards are Padma Vibhushan, Padma Bhushan, and Padma Shri.

• The Padma Shri is awarded for distinguished service in any field.

• The Padma Awards are announced on Republic Day, January 26, and the ceremonies are held at Rashtrapati Bhawan.

Q47. Answer: (b) B

Given word: DANCER

According to the question,

Given word	D	A	N	C	E	R
Vowel → (+1) Consonant → (-1)	(-1)	(+1)	(-1)	(-1)	(+1)	(-1)
Resultant	C	B	M	B	F	Q

Thus, the new formed letter cluster → C B M B F Q

Now, the letter(s) which is/are repeated twice in the new group of letters thus formed: C B M B F Q => B

Thus, 'B' is repeated twice in the new group of letters thus formed.

Hence, "Option 2" is the correct answer.

Q48. Answer: (d) Three

The logic follows here is :-

In the word KNIGHT:

1. Each consonant is changed to the letter immediately succeeding it in the English alphabetical order.

2. Each vowel is changed to the letter immediately preceding it in the English alphabetical order.

Let's apply the changes step-by-step:

Word	K	N	I	G	H	T
Consonant + 1	L	O	I	H	I	U
Vowel - 1	L	O	H	H	I	U

The new sequence of letters is: LOHHIU

There are three vowels 'OIU' in the sequence.

Hence, the correct answer is "Option 4".

Q49. Answer: (a) 273

Given : 76 ÷ 4 + 108 × 3 – 5 = ?

According to the question, after '+' and '-' are interchanged and '×' and '÷' are interchanged:

76 ÷ 4 + 108 × 3 – 5 = ? => 76 × 4 - 108 ÷ 3 + 5 = ?

=> 76 × 4 - 108 ÷ 3 + 5 = ?

=> 76 × 4 - 36 + 5 = ?

=> 304 + 5 - 36 = ?

=> 309 - 36 = ?

=> 273 = ?

Hence, "Option 1" is the correct answer.

Q50. Answer: (d) 39

Shortcut Trick

Apply the Empirical Relationship between measures of central tendency:

Mode = 3 × Median − 2 × Mean

Substitute the values: Mode = 3 × 32 − 2 × 28.5

Mode = 96 − 57 = 39

Therefore The correct answer is 39.

Alternate Method

Given:

Mean of the data = 28.5

Median of the data = 32

Formula Used:

For a moderately skewed distribution: Mode = 3(Median) − 2(Mean)

Calculations:

=> Mode = 3 × 32 − 2 × 28.5

=> Mode = 96 − 57

=> Mode = 39

Therefore The correct answer is 39.

Additional Information

Empirical Relationship

Karl Pearson established this relation for moderately skewed distributions: Mode = 3 Median − 2 Mean.

Symmetric Distribution

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

Mean and Median Formulas

Mean = (∑x)/n | Median is the (n+1)/2^(th) term for odd n, and the average of n/2^(th) and (n/2 + 1)^(th) terms for even n.

Skewness

If Mean > Median > Mode, the distribution is positively skewed; if Mode > Median > Mean, it is negatively skewed.

Q51. Answer: (d) 124%

Shortcut Trick

Use the successive percentage formula for two consecutive increases: Net % Increase = x + y + (xy/100).

Here, x = 60% and y = 40%.

Net % Increase = 60 + 40 + (60 × 40)/100

Net % Increase = 100 + 24 = 124%.

Therefore The correct answer is 124%.

Alternate Method

Given: Income of X is 60% more than Y, and Income of Y is 40% more than Z.

=> Let the income of Z = 100

=> Income of Y = 100 + 40% of 100 = 140

=> Income of X = 140 + 60% of 140

=> Income of X = 140 + 84 = 224

=> Difference between X and Z = 224 − 100 = 124

=> Percentage more = (Difference / Z) × 100 = (124 / 100) × 100 = 124%

Therefore The correct answer is 124%.

Additional Information

Successive Percentage Increase

When a value is increased by x% and the resulting value is further increased by y%, the effective increase is (x + y + xy/100)%.

Ratio Method for Incomes

Incomes can be compared using ratios: if X:Y = 8:5 and Y:Z = 7:5, then combined ratio X:Y:Z = 56:35:25, showing X is 124% more than Z.

Base Value Importance

The percentage comparison always depends on the base (reference) value mentioned in the question (in this case, Z).

Q52. Answer: (b) Only I follows

Given:

Statement: The price of wheat has been steadily rising across the country since the last 3 weeks, due to shortages reported from major wholesale markets.

Courses of Action:

I. The Government should set up an urgent investigation to check the reasons for the shortages - True (Because it is essential to

understand and address the root cause of the wheat shortage in order to stabilize prices).

II. The Government should provide oil at subsidized rates to citizens till wheat supplies are restored - False (Because providing oil at subsidized rates does not directly address the issue of wheat shortage and price rise).

So, Only I follows.

Hence, the correct answer is "Option 2".

Q53. Answer: (c) Mother's mother

Decoding symbols:

A is				
Symbol	•	•	×	÷
Meaning	Mother	Brother	Wife	Father
to B				

Given: P – Q × R ÷ S + T

P – Q → P is the brother of Q.

Q × R → Q is the wife of R.

R ÷ S → R is the father of S.

S + T → S is the mother of T.

Thus, Q is T's maternal grandmother or mother's mother.

Hence, the correct answer is "Option 3".

Q54. Answer: (b) R Ashwin

The correct answer is R Ashwin

Key Points

• As of September 2024, R. Ashwin is India's second-highest wicket-taker in Test matches.

• As of September 2024, the top Indian cricketers with the most wickets in Test matches are:

• Anil Kumble – 619 wickets

• R. Ashwin – 474 wickets

• Kapil Dev – 434 wickets

• Harbhajan Singh – 417 wickets

Additional Information

• Ravichandran Ashwin is an Indian former international cricketer.

• He is a right-arm off spin bowler and a lower order batter.

• Widely regarded as one of the most prolific spinners of all time, he represented the Indian cricket team and was part of the Indian team that won the 2011 Cricket World Cup and the 2013 Champions Trophy.

• He plays for Tamil Nadu and South Zone in domestic cricket and for Chennai Super Kings in the Indian Premier League (IPL).

• Ashwin has taken more than 500 wickets in Tests and was the fastest bowler to reach 300 test wickets in terms of number of innings.

• He has won eleven Man of the Series awards in Tests, which is the most for any cricketer, along with Muttiah Muralitharan.

Q55. Answer: (c) Spinal cord

The correct answer is Spinal cord.

Key Points

• Reflex arcs are formed in the spinal cord, which is a part of the central nervous system.

• They are responsible for involuntary and nearly instantaneous movements in response to a stimulus.

• A reflex arc typically involves a sensory neuron, an interneuron, and a motor neuron, which facilitate the immediate reaction.

• The spinal cord acts as an intermediary, processing the reflex without involving the brain, thus saving time.

• Reflex actions help protect the body from harm, such as quickly withdrawing a hand from a hot surface.

Additional Information

• Medulla

• It is part of the brainstem that controls autonomic functions like breathing and heart rate.

• The medulla is not involved in the formation of reflex arcs but is critical for vital life functions.

• Forebrain

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• This region includes structures such as the cerebrum and thalamus, involved in complex behaviors and cognitive functions.
• It does not play a direct role in reflex arcs.
• Cerebellum
• The cerebellum is responsible for coordinating voluntary movements and maintaining balance and posture.
• While important for motor control, it is not directly involved in reflex arcs.

Q56. Answer: (c) Only conclusion (II) follows

The least possible Venn diagram for the given statements is as shown below :
Conclusions:
(I) Some rings are bottles → Does not follow (As all clothes are rings and no cloth is a bottle. So it is possible but not definite)
(II) Some rings are clothes → Follow (As all clothes are rings. As whole clothes comes in rings, therefore it is true.)
Therefore Here, Only conclusion (II) follows.
Hence, the correct answer is "Option 3".

Q57. Answer: (c) kl

According to the given information,
Thus, according to the given codes the code 'TO' is for the word 'friend'.
Hence, the correct answer is "Option 3".

Q58. Answer: (a) 62

Given Equation: 92 D 12 B 3 C (63 A 3) D 15 = ?
BODMAS Rule:
Decoding the given information:

Alphabet	A	B	C	D
Meaning	÷	×	•	•

Now replacing the sign from left to right using BODMAS Rule, we get:
=> 92 - 12 × 3 + (63 ÷ 3) - 15 = ?
=> 92 - 12 × 3 + 21 - 15 = ?
=> 92 - 36 + 21 - 15 = ?
=> 113 - 36 - 15 = 62.
Hence, the correct option is "Option 1".

Q59. Answer: (c) X = 160, Y = 33

The logic followed here is:
X : 30 :: 175 : Y
So, replacing 'X' and 'Y' in each option one by one:
Option 1) X = 195, Y = 27 => 195 : 30 :: 175 : 27
30 × 5 + 10 = 195
150 + 10 = 195
160 ≠ 195 (LHS ≠ RHS);
27 × 5 + 10 = 175
135 + 10 = 175
145 ≠ 175 (LHS ≠ RHS)
Option 2) X = 145, Y = 38 => 145 : 30 :: 175 : 38
30 × 5 + 10 = 145
150 + 10 = 145
160 ≠ 145 (LHS ≠ RHS);
38 × 5 + 10 = 175
190 + 10 = 175
200 ≠ 175 (LHS ≠ RHS)
Option 3) X = 160, Y = 33 => 160 : 30 :: 175 : 33
30 × 5 + 10 = 160

150 + 10 = 160

160 = 160 (LHS = RHS);

33 × 5 + 10 = 175

165 + 10 = 175

175 = 175 (LHS = RHS)

Option 4) X = 180, Y = 44 => 180 : 30 :: 175 : 44

30 × 5 + 10 = 180

150 + 10 = 180

160 ≠ 180 (LHS ≠ RHS);

44 × 5 + 10 = 175

220 + 10 = 175

230 ≠ 175 (LHS ≠ RHS)

Hence, "Option 3" is the correct answer.

Q60. Answer: (c) Ravichandra Ashwin

The correct answer is Ravichandran Ashwin

Key Points

• As of September 2024, Ravichandran Ashwin holds the record of scoring 6 centuries and taking 522 wickets in Test cricket.

• Ravichandran Ashwin is one of India's premier all-rounders and a key player in Test cricket.

• He is consistently ranked among the top bowlers in Test cricket globally.

• Ashwin has been a vital asset for the Indian cricket team, contributing both with his spin bowling and his batting prowess.

• Ravindra Jadeja:

• Known primarily as a left-arm spinner and an all-rounder, Ravindra Jadeja has been instrumental for India in both Test and limited-overs cricket.

• Hardik Pandya:

• Hardik Pandya, primarily an all-rounder, has been more effective in limited-overs cricket (ODIs and T20s) with his aggressive batting and fast-medium bowling.

• Akshar Patel:

• Akshar Patel is a promising left-arm spinner, but as of now, his Test career is still developing.

Q61. Answer: (d) 10 minutes

Shortcut Trick

Convert 4 min 10 sec to total seconds: (4 × 60) + 10 = 250 sec.

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

For 2.5 km, time taken = 250 sec.

=> For 1 km, time taken = 250 ÷ 2.5 = 100 sec.

=> For 6 km, time taken = 6 × 100 = 600 sec.

Converting back to minutes: 600 ÷ 60 = 10 min.

Therefore The correct answer is 10 min.

Alternate Method

Given:

Distance1 = 2.5 km = 2500 m

Time1 = 4 min 10 sec = (4 × 60) + 10 = 250 sec

Distance2 = 6 km = 6000 m

Formula Used:

Speed = Distance ÷ Time

Time = Distance ÷ Speed

=> Speed of cyclist = 2500 m ÷ 250 s = 10 m/s

=> Time to cover 6000 m = 6000 m ÷ 10 m/s

=> Time2 = 600 seconds

=> Time in minutes = 600 ÷ 60 = 10 min

Therefore The correct answer is 10 min.

Additional Information

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Direct Proportionality

When speed is constant, the distance covered is directly proportional to the time taken (D1 ÷ T1 = D2 ÷ T2).

Unit Conversion (km/h and m/s)

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

Time Conversion

Always ensure all units are consistent (e.g., all distances in meters and all times in seconds) before applying the speed formula.

Q62. Answer: (a) 340

Shortcut Trick

Use the Effective Multiplier method to find the selling price.

Value of x = Marked Price × (100 − d1)% × (100 − d2)%

x = 500 × 80/100 × 85/100

x = 500 × 0.8 × 0.85 = 400 × 0.85 = 340

Therefore The correct answer is Rs. 340.

Alternate Method

Given:

Marked Price (MP) = Rs. 500

First Discount (d1) = 20%

Second Discount (d2) = 15%

Formula Used:

Selling Price (SP) = MP × (100 − d1)/100 × (100 − d2)/100

Calculations:

=> Price after first discount = 500 − (20% of 500)

=> Price after first discount = 500 − 100 = Rs. 400

=> Value of x (Price after second discount) = 400 − (15% of 400)

=> x = 400 − (15/100 × 400)

=> x = 400 − 60

=> x = 340

Therefore The correct answer is Rs. 340.

Additional Information

Single Equivalent Discount

For two successive discounts d1 and d2, the single equivalent discount is (d1 + d2 − (d1 × d2)/100)%.

Successive Percentage Change

Final Value = Initial Value × (1 ± r1/100) × (1 ± r2/100), where r represents the percentage increase or decrease.

Marked Price vs Selling Price

The Selling Price is always calculated by subtracting the Discount from the Marked Price: SP = MP − Discount.

Q63. Answer: (d) 140 days

Shortcut Trick

Equating work efficiency: (8M + 12W) × 10 = (6M + 8W) × 14

=> 80M + 120W = 84M + 112W => 8W = 4M => 1M = 2W

Efficiency ratio M : W = 2 : 1. Total Work = (8 × 2 + 12 × 1) × 10 = 280 units.

Days for 1 Woman = 280 ÷ 1 = 280 days; Days for 1 Man = 280 ÷ 2 = 140 days.

Difference = 280 − 140 = 140 days.

Therefore The correct answer is 140 days.

Alternate Method

Given:

Case 1: 8 men and 12 women build a wall in 10 days.

Case 2: 6 men and 8 women build the wall in 14 days.

Formula Used:

Total Work = (M1 × D1) = (M2 × D2)

Calculations:

=> (8M + 12W) × 10 = (6M + 8W) × 14

=> 80M + 120W = 84M + 112W

=> 120W − 112W = 84M − 80M

=> 8W = 4M => 1M = 2W

=> Total Work (in terms of women) = (8 × 2W + 12W) × 10 = 28W × 10 = 280W units

=> Time taken by 1 woman alone = 280W ÷ 1W = 280 days

=> Time taken by 1 man alone = 280W ÷ 2W = 140 days

Person	Days	Total Work	Efficiency
1 Woman	280	280	1
1 Man	140	2	

=> Difference in days = 280 days − 140 days = 140 days.

Therefore The correct answer is 140 days.

Additional Information

Work Equivalence Formula

When different groups perform the same work, use (M1D1H1) / W1 = (M2D2H2) / W2 to find the relationship between efficiencies.

Efficiency and Time Relationship

Efficiency is inversely proportional to the time taken to complete a work. If 1M = 2W, then a man is twice as efficient as a woman and takes half the time.

Combined Rate Rule

Total efficiency of a group is the sum of the individual efficiencies of all members in that group.

Q64. Answer: (b) Fs

The correct answer is Fs.

Key Points

• Work done (W) by a force (F) is calculated using the formula: W = F × s, where s is the displacement.

• In this problem, the force (F) and displacement (s) are in the same direction.

• Hence, the work done is positive and is given by the product of the force and displacement.

• Uniform velocity (v) indicates that the force is applied uniformly over the distance.

• Therefore, the correct option for the work done by the force is Fs (Option 2).

Additional Information

• Force and Work

• Force is a vector quantity that causes an object to move or change its motion.

• Work is a scalar quantity and is the measure of energy transfer when a force moves an object over a distance.

• Energy

• Energy is the capacity to do work and is measured in joules (J).

• Work and energy are closely related; the work done on an object transfers energy to the object.

• Kinetic Energy

• An object moving with velocity (v) has kinetic energy given by the formula: KE = 0.5 × m × v^2.

• The work done by a force can change the kinetic energy of an object.

Q65. Answer: (b) 6.98

Given:

(4.33 × 4.33 - 2.65 × 2.65)/1.68

Formula used:

$(a^2 - b^2) = (a - b)(a + b)$

Calculation:

Here, (a = 4.33) and (b = 2.65).

=> $(4.33^2 - 2.65^2)/1.68 = (4.33 - 2.65)(4.33 + 2.65)/1.68$

=> (1.68)(6.98)/1.68

=> (1.68 × 6.98)/1.68 = 6.98

Therefore The simplified result is 6.98.

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Q66. Answer: (b) Rs. 300

Shortcut Trick

Ratio of X's pay to Y's pay = 120 : 100 = 6 : 5

Total ratio parts = 6 + 5 = 11 parts

11 parts → Rs. 660

1 part → Rs. 660 ÷ 11 = Rs. 60

Y's pay = 5 parts = 5 × 60 = Rs. 300

Therefore The correct answer is Rs. 300.

Alternate Method

Given:

Total pay of X and Y = Rs. 660 per day

X is paid 120% of the sum paid to Y.

Calculations:

=> Let the daily amount paid to Y be Rs. y.

=> Daily amount paid to X = 120% of y = 1.2y

=> Total daily pay = X + Y

=> 1.2y + y = 660

=> 2.2y = 660

=> y = 660 ÷ 2.2

=> y = 300

=> The daily amount paid to Y is Rs. 300.

Therefore The correct answer is Rs. 300.

Additional Information

Wages and Ratio Distribution

When a total sum is distributed among individuals, their individual share is directly proportional to the relative parts they hold in the simplified total ratio.

Work & Wages Principle

If multiple people work together for the same number of days, the combined wages given to them are exactly distributed in the ratio of their individual daily work efficiencies.

Percentage to Ratio Conversion

If A is x% of B, the relative ratio of A to B directly translates to x : 100. This percentage ratio can be further simplified into smaller fractions to make calculations faster and easier.

Q67. Answer: (c) Croton

The correct answer is Croton.

Key Points

• Variegated leaves are leaves that have multiple colors, often displaying patterns of green with white, yellow, or other colors.

• Croton plants are known for their vibrant, multi-colored leaves which make them popular as ornamental plants.

• The variegation in Croton leaves is due to the presence of different pigments such as chlorophyll, carotenoids, and anthocyanins.

• Variegated leaves can sometimes have reduced chlorophyll, leading to sections of the leaf that are less green or even white.

• Variegation can occur naturally or be induced through selective breeding and genetic manipulation.

Additional Information

• Banana Plant

• Banana plants typically have large, green leaves without variegation.

• They are primarily known for their fruit rather than their foliage.

• Neem Plant

• Neem leaves are usually green and do not exhibit variegation.

• Neem is valued for its medicinal properties.

• Rose Plant

• Rose leaves are typically green and do not exhibit variegation.

• Roses are primarily cultivated for their flowers.

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Q68. Answer: (c) yellow flame

The correct answer is yellow flame.

Note: We have provided the answer as per the official answer key. Naphthalene is an unsaturated compound and hence, it burns with a yellow flame with release of black smoke (sooty flame). Thus, both Option 3 and Option 4 can be correct but Option 3 is the right answer as per the official answer key.

Key Points

• Naphthalene, when burned, produces a yellow flame.

• This yellow flame is due to the incomplete combustion of naphthalene.

• Incomplete combustion occurs because naphthalene is a hydrocarbon and has a high carbon content.

• The yellow color in the flame is typically due to the presence of carbon particles (soot) that are heated to incandescence.

• Naphthalene combustion often produces a noticeable amount of soot and smoke.

Additional Information

• Hydrocarbons

• Hydrocarbons are organic compounds consisting entirely of hydrogen and carbon atoms.

• They can be found in various forms such as alkanes, alkenes, and alkynes.

• Common hydrocarbons include methane, ethane, propane, and butane.

• Combustion

• Combustion is a chemical reaction that occurs between a fuel and an oxidizing agent, producing heat and light.

• Complete combustion produces carbon dioxide and water, while incomplete combustion can produce carbon monoxide and soot.

• Soot

• Soot is a black powdery or flaky substance consisting largely of amorphous carbon, produced by the incomplete burning of organic matter.

• Soot can have various health impacts and contribute to air pollution.

Q69. Answer: (b) 3

The logic followed here is:

'KNEW' is coded as '4682'

'KINE' is coded as '6238'

Thus, 'I' is coded as '3'.

Hence, "Option 2" is the correct answer.

Q70. Answer: (b) SW-UY

The logic followed here is:

Option 1) LO-MP

Option 2) SW-UY

Option 3) TW-UX

Option 4) CF-DG

Thus, out of all the options, 'SW-UY' is the odd one out.

Hence, "Option 2" is the correct answer.

Q71. Answer: (c) 2sinA

Shortcut Trick

Use the Value Substitution Method by assuming A = 45°.

Substitute A = 45° into the expression: sin 45° + (cos 45°) / tan(90° − 45°)

=> 1/√2 + (1/√2) / tan 45° = 1/√2 + (1/√2) / 1 = 2/√2 = √2

Check option 3: 2 sin 45° = 2 × (1/√2) = 2/√2 = √2.

The values match perfectly, confirming the simplification.

Therefore The correct answer is 2sinA.

Alternate Method

Given Expression: sin A + (cos A) / tan(90 − A)

Formula Used:

1. Complementary Angle Identity: tan(90 − A) = cot A

2. Trigonometric Ratio: cot A = cos A / sin A

Calculations:

=> sin A + (cos A) / cot A

=> sin A + (cos A) / (cos A / sin A)

=> sin A + cos A × (sin A / cos A)

=> sin A + sin A

=> 2 sin A

Therefore The correct answer is 2sinA.

Additional Information

Complementary Angle Identities

Trigonometric ratios of complementary angles change as sin(90 − θ) = cos θ, cos(90 − θ) = sin θ, and tan(90 − θ) = cot θ.

Reciprocal Identities

The ratio tan θ is the reciprocal of cot θ, meaning tan θ × cot θ = 1, and similarly sin θ × cosec θ = 1.

Pythagorean Identities

Fundamental identities include $\sin^2 A + \cos^2 A = 1$, which are used to solve complex trigonometric simplifications.

Q72. Answer: (d) 8%

Shortcut Trick

Difference in principal between B and A = Rs. 11,000 − Rs. 8,000 = Rs. 3,000.

Extra simple interest generated by this additional Rs. 3,000 in 3 years = Rs. 720.

Extra simple interest for 1 year = Rs. 720 ÷ 3 = Rs. 240.

Rate of interest = (Interest for 1 year ÷ Extra Principal) × 100

Rate = (240 ÷ 3000) × 100 = 8%.

Therefore The correct answer is 8%.

Alternate Method

Given:

Principal of A (P_A) = Rs. 8,000

Principal of B (P_B) = Rs. 11,000

Time (T) = 3 years

Difference in Interest (SI_B − SI_A) = Rs. 720

Formula Used:

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

A's Principal: Rs. 8,000

B's Principal: Rs. 11,000

• Rs. 3,000

Extra Interest in 3 yrs = Rs. 720 → Rate = 8%

Calculations:

=> Let the uniform rate of interest be R% per annum.

=> Interest received by B = (11000 × R × 3) ÷ 100 = 330R

=> Interest received by A = (8000 × R × 3) ÷ 100 = 240R

=> Difference in Interest = 330R − 240R

=> 90R = 720

=> R = 720 ÷ 90

=> R = 8

Therefore The correct answer is 8%.

Additional Information

Simple Interest vs Compound Interest

Simple Interest is calculated only on the initial principal amount throughout the entire period, while Compound Interest is calculated on both the principal and the accumulated interest from previous periods.

Compound Interest Formula

A = P(1 + R÷100)^T, where A is the total amount, P is the principal, R is the rate of interest, and T is the time period.

Difference between CI and SI for 2 years

Difference = P × (R÷100)²

Q73. Answer: (d) Vessels and Tracheids

The correct answer is Vessels and Tracheids.

Key Points

• Xylem is a type of vascular tissue in plants responsible for the conduction of water and nutrients from the roots to the rest of the plant.

• Vessels and tracheids are the primary water-conducting elements in the xylem tissue.

• Vessels are long tubes formed by the end-to-end connection of vessel elements, allowing efficient water transport.

• Tracheids are elongated cells with tapered ends that overlap each other, facilitating water movement through their pits.

• Both vessels and tracheids have thick, lignified walls that provide structural support to the plant.

Additional Information

• Xylem Fibers

• These are supportive fibers present in the xylem that provide mechanical strength to the plant.

• They are not involved in water conduction.

• Phloem

• It is another type of vascular tissue responsible for the transport of nutrients, particularly sugars, from the leaves to other parts of the plant.

• Phloem consists of sieve tube elements, companion cells, phloem fibers, and phloem parenchyma.

• Plant Roots

• Roots absorb water and minerals from the soil and transport them to the xylem.

• They also anchor the plant and store nutrients.

Q74. Answer: (b) 1440°

Shortcut Trick

Number of diagonals = n(n − 3) ÷ 2 = 35

=> n(n − 3) = 70

=> 10 × (10 − 3) = 70, so n = 10 sides.

Sum of interior angles = (n − 2) × 180°

=> (10 − 2) × 180° = 8 × 180° = 1440°.

Therefore The correct answer is 1440°.

Alternate Method

Given: Number of diagonals of a regular polygon = 35.

Formula Used:

1. Number of diagonals = n(n − 3) ÷ 2

2. Sum of interior angles = (n − 2) × 180°

where n represents the number of sides of the polygon.

Calculations:

=> n(n − 3) ÷ 2 = 35

=> $n^2 - 3n = 70$

=> $n^2 - 3n - 70 = 0$

=> $n^2 - 10n + 7n - 70 = 0$

=> n(n − 10) + 7(n − 10) = 0

=> (n − 10)(n + 7) = 0

=> n = 10 (since number of sides cannot be negative, n = −7 is rejected).

Now, calculate the sum of interior angles:

=> Sum = (10 − 2) × 180°

=> Sum = 8 × 180° = 1440°.

Therefore The correct answer is 1440°.

Additional Information

Each Interior Angle

For a regular polygon, each interior angle is given by [(n − 2) × 180°] ÷ n.

Sum of Exterior Angles

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The sum of the exterior angles of any convex polygon is always 360°.

Each Exterior Angle

For a regular polygon, each exterior angle is 360° ÷ n. Also, Interior Angle + Exterior Angle = 180°.

Q75. Answer: (a) 20

Shortcut Trick

Arrange the data in ascending order: 11, 15, 16, 17, 19, 21, 33, 51, 71, 75.

Since the total number of terms (n = 10) is even, the median is the average of the two middle terms.

Middle terms are the 5^(th) (19) and 6^(th) (21) values.

Median = (19 + 21) ÷ 2 = 20.

Therefore The correct answer is 20.

Alternate Method

Given Data: 11, 16, 33, 15, 51, 19, 71, 75, 21, 17

Formula Used:

If n is even, Median = [(n/2)^(th) term + (n/2 + 1)^(th) term] ÷ 2

=> Step 1: Arrange data in ascending order: 11, 15, 16, 17, 19, 21, 33, 51, 71, 75

=> Step 2: Number of observations (n) = 10

=> Step 3: Median = [(10/2)^(th) term + (10/2 + 1)^(th) term] ÷ 2

=> Step 4: Median = [5^(th) term + 6^(th) term] ÷ 2

=> Step 5: Median = [19 + 21] ÷ 2

=> Step 6: Median = 40 ÷ 2 = 20

Therefore The correct answer is 20.

Additional Information

Median for Odd Observations

If n is odd, the median is the ((n + 1) ÷ 2)^(th) observation after arranging the data in order.

Empirical Relationship

The relationship between Mean, Median, and Mode is given by: Mode = 3 × Median − 2 × Mean.

Mean (Arithmetic Average)

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

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