RRB Group D Previous Year Paper (Held on: 30 Sept 2022 Shift 1)

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

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Practise under exam conditions, then review your answers after you submit.

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CBT

Q1. A man sells potatoes at Rs. 27 per kg, which he bought at Rs. 25 per kg. He also uses a faulty weight and each time gives 800 g instead of 1 kg. His actual gain percentage is:

(a) 35%
(b) 20%
(c) 25%
(d) 40%

Q2. Three statements are given, followed by two conclusions numbered I and II. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

1. All flowers are white.
2. Some flowers are dark.
3. All darks are blue.

Conclusions:

I. Some whites are blue.

II. All darks are white.

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

Q3. Which of the following countries won the Thomas Cup for the first time ever, in 2022?

(a) China
(b) Indonesia
(c) Japan
(d) India

Q4. Evaluate ((-5)/7)^(-6) ×((-5)/7)^4.

(a) 125/343
(b) 25/49
(c) 49/25
(d) 343/125

Q5. Select the correct chronological order of Acts and policies according to their first appearance in the Indian Constitution and legislative.

(a) Right to Information Act, Right to Education Act, Right to Person with Disabilities Act, Information Technology Act
(b) Right to Education Act, Information Technology Act, Right of Persons with Disabilities Act, Right to Information Act
(c) Information Technology Act, Right to Information Act, Right to Person with Disabilities Act, Right to Education Act

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(d) Information Technology Act, Right to Information Act, Right to Education Act, Right to Person with Disabilities Act

Q6. An object of size 3.0 cm is placed at a distance of 50 cm from a concave lens of focal length 25 cm. The size of the image formed will be:

(a) 1.2 cm
(b) 0.33 cm
(c) 1.0 cm
(d) 1.5 cm

Q7. A statement is given followed by four conclusions. Find out which conclusion is INCORRECT based on the given statement.

Statement: S > W = T < L < O ≤ R

Conclusions:

1. W < R
2. S > L
3. W < O
4. T < S

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

Q8. Which of the following compounds can conduct electricity?

(a) Sodium chloride
(b) Kerosene
(c) Glucose
(d) Alcohol

Q9. 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.

F G _ C _ I Q _ S F _ S C A I Q _ S F _ S C _ I _ P S

(a) SAPGBGAP
(b) SAPGPGAQ
(c) SAPGPGBQ
(d) SAPFBFAP

Q10. Maulana Azad National Urdu University (MANUU) is a Central University established at National Level in ____ by an act of Parliament.

(a) 2004
(b) 2001
(c) 1998
(d) 1999

Q11. An element 'A' reacts with chlorine to give a compound ACl with a high melting point. This compound is also soluble in water. The element 'A' is likely to be:

(a) sodium
(b) iron
(c) carbon
(d) silicon

Q12. Which of the following statements with respect to position of elements having atomic number 11, 12, 13, 14, 15, 16, 17 and 18, respectively, in the modern periodic table is INCORRECT?

(a) These elements belong to the second period of the modern periodic table.
(b) These elements belong to the third period of the modern periodic table.
(c) Electrons in the atoms of these elements are filled in K, L and M shells.

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(d) These elements are placed in the same period in the modern periodic table.

Q13. In this question, a group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number/symbol	3	#	6	4	@	$	7	2	%	5	=	9	8
Code	T	H	J	K	M	P	U	D	U	E	W	V	S

Conditions:

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

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

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

Decode %$7#8 using the above information.

(a) SKUHU
(b) SPIHU
(c) UPUHS
(d) SPUHU

Q14. Select the correct group of fundamental rights provided by the Constitution of India from the given alternatives.

A. Right to equality
B. Right to freedom of religion
C. Right to financial support for higher and professional education
D. Right to constitutional remedies
E. Right to paternal properties

(a) A, B and D
(b) A, C and E
(c) C, D and E
(d) B, D and E

Q15. In this question, a group of numbers/symbols is coded using letters as per the given table and the conditions which follow. The correct combination of codes following the conditions is your answer.

Number/symbol	$	3	@	8	%	2	#	&	6	ψ	π	7	5	φ
Code	A	V	L	K	R	M	B	F	N	T	E	C	S	W

Conditions:

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

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

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

ψ62%85

(a) TNMRKS
(b) SNMRKT
(c) SNLRBT
(d) TNBRLS

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Q16. Which of the following is non-biodegradable?

(a) Cotton
(b) Wool
(c) Coffee powder
(d) Nylon

Q17. Which of the following is divisible by 9?

(a) 2352
(b) 3132
(c) 2121
(d) 1099

Q18. The commercial unit of electrical energy is _____.

(a) Kilowatt hour
(b) Calorie
(c) Joule
(d) Watt

Q19. The width of a rectangle is one-third of its length. If the perimeter of the rectangle is 64 cm, find the width of the rectangle.

(a) 16 cm
(b) 21 cm
(c) 8 cm
(d) 24 cm

Q20. Seven boxes E, F, G, H, I, J and K are kept one over the other but not necessarily in the same order. Only three boxes are kept between F and J. Neither G nor I is kept at the top. Only H is kept between G and I. K is kept immediately below J. Only one box is kept above F. How many boxes are kept between H and K?

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

Q21. P, Q, R, S and T live on five different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it, number 2 and so on till the topmost floor is numbered 5.

P lives immediately below T and immediately above S. P lives on an odd numbered floor. If R is not on the lowermost floor, where does T live?

(a) 1st floor
(b) 2nd floor
(c) 5th floor
(d) 4th floor

Q22. Select the correct statement about Rajya Sabha.

(a) It is called upper house of parliament and it never dissolves.
(b) The President of India act as ex-officio Chairman of Rajya Sabha.
(c) A member who is elected for a full term in Rajya Sabha serves for a period of four years.
(d) It is the lower house of parliament and it dissolves every five years.

Q23. The Shanti Swarup Bhatnagar Prize for Science and Technology is a science award in India given annually by which of the following scientific bodies?

(a) Indian Council of Medical Research (ICMR)
(b) Department of Science and Technology (DST)
(c) Department of Biotechnology (DBT)
(d) Council of Scientific and Industrial Research (CSIR)

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Q24. Aquatic animals like fishes, excrete waste in which of the following forms?

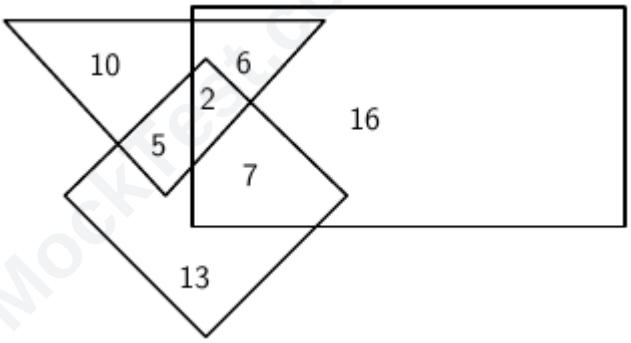
(a) Urea
(b) Ammonia
(c) Uric acid
(d) Sweat salts

Q25. What is the correct statement about Mayor?

(a) Tenure of Mayors of cities in India is fixed for five years.
(b) Mayor is elected by the Governor of the State.
(c) Mayor is the second citizen of the Municipal Corporation after City Magistrate.
(d) Mayor is the head of the Municipal Corporation.

Q26. In the following Venn diagram, the rectangle represents 'fruits', the triangle represents 'sour tasting eatables', and the square represents 'yellow coloured eatables'.

Select the option which represents the number of sour tasting yellow fruits.



(a) 6
(b) 2
(c) 5
(d) 7

Q27. On the eve of independence, what was the GDP of India?

(a) Rs. 1 lakh crore
(b) Rs. 27 lakh crore
(c) Rs. 270 lakh crore
(d) Rs. 2.7 lakh crore

Q28. Who won the Male Single's title of the All England Badminton Championship 2022?

(a) Lakshya Sen
(b) Viktor Axelsen
(c) Lee Zii Jia
(d) Kidambi Srikanth

Q29. Match the cities in column-A with the rivers in column-B.

	Column-A (City)		**Column-B (River)**
a.	Ahmedabad	1.	Godavari
b.	Kolkata	2.	Brahmaputra
c.	Guwahati	3.	Sabarmati
d.	Nasik	4.	Hooghly

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

Q30. Which of the following options is the closest approximate value which will come in place of the question mark (?) in the following equation?

2.33 - 4.12 + 6.13 × 11.3 = ?

(a) 106
(b) 64
(c) 39
(d) 43

Q31. Which of the following options is the closest approximate value which will come in place of the question mark (?) in the following equation?

$3.01^3 \div 2.99 \times 6.01 = ?$

(a) 46
(b) 54
(c) 64
(d) 36

Q32. Find the value of n, when 216^(2/n) = 36.

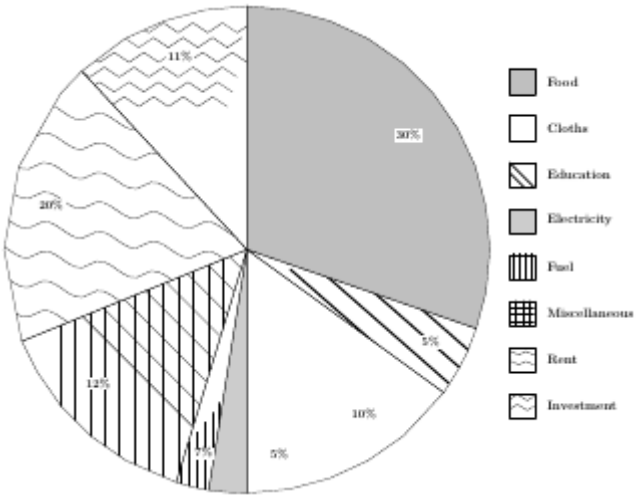
(a) 6
(b) 1
(c) 9
(d) 3

Q33. The polarity of an electromagnet can be reversed by changing the _____.

(a) direction of current
(b) distance between the turns
(c) magnitude of the current flowing through it
(d) number of turns in the electromagnet

Q34. The given pie chart shows the expenses of a family in a month.

Read the chart and answer the question that follows.



What is the central angle for total expenditure on fuel, miscellaneous and investment?

(a) 102°
(b) 108°
(c) 98°
(d) 100°

Q35. Arrange the numbers given below in ascending order.

705.0, 7.005, 7.500, 70.50, 7050, 7.050, 75

(a) 7050, 705.0, 75, 70.50, 7.500, 7.050, 7.005
(b) 7.005, 7.500, 7.050, 70.50, 75, 705.0, 7050

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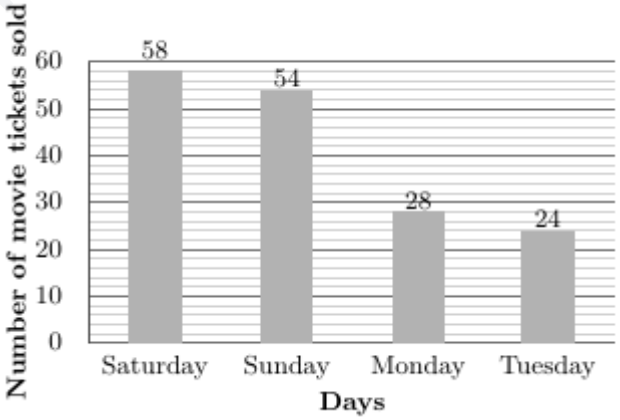
(c) 7.005, 7.050, 7.500, 70.50, 75, 705.0, 7050
(d) 7.005, 7.500, 7.050, 75, 70.50, 705.0, 7050

Q36. What is that production cycle called in which at least one factor of production remains constant?
(a) Long run production
(b) Variable long term production
(c) constant long term production
(d) short run production

Q37. The external length, breadth and depth of a cuboidal iron storage space are 4 m, 3.6 m, and 1.5 m, respectively. It is open at the top. What is the cost (in Rs.) of painting its outer surface at the rate of Rs. 55 per m^2?
(a) 2,046
(b) 2,838
(c) 1,991
(d) 1,936

Q38. Find the total surface area of a solid right circular cylinder whose radius of base is 2 cm, and the height is 10 cm.
(a) 840000π cm^2
(b) 48π cm2
(c) 8.4π cm2
(d) 84000π cm2

Q39. Study the given bar graph and answer the following question.
The given bar graph depicts the number of movie tickets sold on four days.



If the average number of tickets sold on Monday, Tuesday and Wednesday was 31, what was the number of tickets sold on Wednesday?
(a) 39
(b) 41
(c) 43
(d) 45

Q40. Arun is the elder brother of Kiran. The difference in their ages is 20 years. If 5 years ago, Arun was 5 times as old as Kiran then was, then find the present age (in years) of Arun.
(a) 30
(b) 40
(c) 10
(d) 20

Q41. A statement is given followed by four conclusions. Find out which conclusion is NOT true based on the given statement.
Statement: P < Q ≤ R < S > T ≥ U > V
Conclusions:

1) T > V
2) P < R
3) S ≥ V
4) Q < S

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

Q42. Six boxes M, N, O, P, Q and R are kept one above the other but not necessarily in the same order. Only 2 boxes are kept below M. Only one box is kept above Q. O is kept at any of the positions above R but not at the topmost position. R is not kept at the bottom most position. N is kept at any of the positions below Q. Where is box P kept?

(a) 3rd from the bottom
(b) 2nd from the bottom
(c) 3rd from the top
(d) At the topmost position

Q43. The emergent ray from the optical centre of the lens will be _____.

(a) un-deviated
(b) deviated
(c) bent
(d) reflected

Q44. How many districts of West Bengal were included in the 'Combating Child Trafficking' campaign in August 2022?

(a) 15
(b) 5
(c) 11
(d) 22

Q45. Which of the following reactions is the most accurate representation of the reaction between barium chloride and sodium sulphate?

(a) $Na_2SO_4 + BaCl \rightarrow BaSO_4 + 2NaCl$
(b) $NaSO_4 + BaCl_2 \rightarrow BaSO_4 + NaCl_2$
(c) $Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$
(d) $NaSO_4 + BaCl \rightarrow BaSO_4 + NaCl$

Q46. Which of the following numbers will replace the question mark (?) in the given number series?

29, 30, 34, 43, 59, ?

(a) 84
(b) 82
(c) 79
(d) 86

Q47. Refer to the following number series and answer the question.

(Left) 9 2 3 5 7 8 6 3 2 1 5 6 7 9 4 3 6 3 5 8 2 (Right)

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

(a) Six
(b) Four
(c) Five
(d) Three

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Q48. If 25 : 15 :: 15 : x, then find the value of x.

(a) 9
(b) 15
(c) 11
(d) 13

Q49. Currently Hema is 48 years old and Roja is 32 years old. How many years ago was the ratio of their ages 5 : 3?

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

Q50. Each vowel in the word 'REASON' is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order. If each letter of the word thus formed is arranged in alphabetical order, which letter is fourth from the left?

(a) M
(b) P
(c) Q
(d) F

Q51. Six students are sitting around a circular table facing the centre. Taran is an immediate neighbour of Karam and Viraj. Param is sitting second to the right of Taran. Sunny is an immediate neighbour of Param and Manjit. Karam is sitting second to the right of Sunny. Who is the immediate neighbour of Sunny and Viraj?

(a) Param
(b) Karam
(c) Taran
(d) Manjit

Q52. Which of the following numbers will replace the question mark (?) in the given series?

40 31.2 23.2 16 9.6 ?

(a) 3
(b) 4
(c) 3.8
(d) 4.2

Q53. Read the given statements and conclusions carefully. Assuming that the information given in the statements is true, even if it appears to be at variance with commonly known facts, decide which of the given conclusions logically follow(s) from the statements.

Statements: 1. Some classical dancers are students.

2. Rama is a classical dancer.

3. Sohan is a student of class X.

Conclusions: (I) Sohan is not a classical dancer.

(II) Rama is a student.

(a) Only conclusion I follows.
(b) Both conclusions I and II follow.
(c) None of the conclusions definitely follow.
(d) Only conclusion II follows.

Q54. The radius of curvature of a convex mirror of focal length 2 m is:

(a) 4.0 m
(b) 2.0 m
(c) 1.0 m
(d) 0.5 m

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Q55. How is urea removed from the blood by an artificial kidney?

(a) By absorption
(b) By filtration
(c) By enzymatic action
(d) By dialysis

Q56. The process of obtaining images of different body parts by using a weak magnetic field produced inside the body is called _____.

(a) MRI scan
(b) Ultrasound scan
(c) PET scan
(d) CT scan

Q57. The Mahanadi River system is the third largest in the peninsula of India and the largest river of ____.

(a) Odisha
(b) Assam
(c) West Bengal
(d) Telangana

Q58. Select the correct combination of mathematical signs that can sequentially replace the * and balance the given equation.

32 * 16 * 8 * 2 * 3 * 5 * 5

(a) -, +, ÷, =, ×, +
(b) +, -, ÷, ×, =, +
(c) -, +, ÷, ×, =, +
(d) -, +, ×, =, ÷, +

Q59. In which group of modern periodic table are halogens placed?

(a) 18th
(b) 1st
(c) 17th
(d) 16th

Q60. 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:

Kids should be allowed to use mobile phones from an early age.

Arguments:

I. Continuous use of mobile phone causes distraction for the kids.

II. A lot of educational apps encourage playful competition among kids while enhancing the way they learn new ideas.

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

Q61. If the time in the mirror image of a 12-hour clock is 3 : 25, what is the actual time?

(a) 8 : 35
(b) 9 : 35
(c) 8 : 45
(d) 7 : 45

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Q62. The allotrope of which non-metal conducts electricity?

(a) Phosphorous
(b) Carbon
(c) Sulfur
(d) Oxygen

Q63. Narmada Bachao Andolan is related to:

(a) Hirakud Dam
(b) Sardar Sarovar Dam
(c) Bhakra Nangal Dam
(d) Nagarjuna Sagar Dam

Q64. The ratio of the ages of Arjun and Dharma is 4 : 5. Four years ago, this ratio was 10 : 13. What will be the ratio of their ages after 3 years?

(a) 7 : 9
(b) 9 : 11
(c) 5 : 7
(d) 8 : 13

Q65. In the phenomena of electromagnetic induction, when the coil carrying current and magnetic field are stationary, the galvanometer _____.

(a) Shows deflection on both sides alternately
(b) deflects right
(c) deflects left
(d) shows null deflection

Q66. Which of the following alternatives is NOT a source of formal data on unemployment in India?

(a) National Sample Survey Reports
(b) Reports of National Family Health Survey
(c) Reports of Census of India
(d) Reports by Directorate General of Employment

Q67. Town X is west of town Y. Town Q is north of X. Town P is east of Q and north-west of Y. What is the position of town P with respect to X?

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

Q68. If the arithmetic mean of 11, 15, 13, p and 10 is 11, then the value of p is:

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

Q69. The net resistance of the two resistors connected in series is 6 ohm. If one of the resistances is 2 ohm, what is the other resistance if the current flowing through them is 4 amp?

(a) 3 ohm
(b) 12 ohm
(c) 4 ohm
(d) 8 ohm

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Q70. The graph of $y = 9x^2 + 16$:

(a) either intersects or touches the x-axis
(b) neither intersects nor touches the x-axis
(c) intersects the x-axis at -4/3 and 4/3
(d) touches the x-axis at 4/3

Q71. Seven boys, M, N, O, P, Q, R and S, are sitting around a circular table facing the centre. Exactly two boys sit between S and N, to the right of S. P is an immediate neighbour of M and S. R is second to the right of P and to the immediate right of S. N is an immediate neighbour of Q and O. If O is third to the left of M, where is Q seated?

(a) Fourth to the left of P
(b) Second to the left of P
(c) To the immediate left of P
(d) Third to the left of P

Q72. Mother Teresa was canonized by Pope Francis I on September 4, _____.

(a) 2014
(b) 2018
(c) 2012
(d) 2016

Q73. In December 2021, to improve leadership skills of grassroot women political leaders, the National Commission for Women (NCW) launched a pan-India capacity building programme. What is the name of this programme?

(a) 'She is a Leader'
(b) 'She is a Changemaker'
(c) 'Ladki Hoon, Lad Sakti Hoon'
(d) 'Womanhood at Grassroot'

Q74. Which among the following statement is FALSE about transportation through phloem?

(a) Transportation in phloem is by Utilization of energy (ATP)
(b) Sucrose is transported initially by using energy into phloem
(c) Increase in osmotic pressure due to sucrose causes water to move into phloem.
(d) Transportation in phloem uses GTP & CTP

Q75. Find the gain percentage, given that Bushra sold her scooter for Rs. 15,000 gaining one-fifth of the selling price.

(a) 15%
(b) 10%
(c) 20%
(d) 25%

Q76. Find the ratio between the LCM and the HCF of 5, 15 and 20.

(a) 12 : 1
(b) 14 : 3
(c) 11 : 2
(d) 8 : 1

Q77. A person borrows Rs. 20,000 at 25% compound interest per year, compounded annually. At the end of every year, he pays Rs. 2,500 as part payment. How much does he still owe after two such instalments?

(a) Rs. 25,625
(b) Rs. 25,825
(c) Rs. 25,925
(d) Rs. 25,725

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Q78. 20% of the population of a city died due to war, and of the remaining population, 5% died in an epidemic. If the present population of the city is 15,200, then find the population of the city before the war.

(a) 19,680
(b) 20,000
(c) 20,100
(d) 23,500

Q79. What is the genetic material inherited from one generation to other?

(a) RNA
(b) Proteins
(c) DNA
(d) Enzymes

Q80. Hemodialysis consists of several tubes having semi-permeable lining suspended in tank having fluid that has _____.

(a) Same composition as blood except that it has more heparin
(b) Same osmotic pressure as blood and is devoid of nitrogenous wastes
(c) Same composition as renal filtrate
(d) Low osmotic pressure to enable movement of molecules

Q81. Find the arithmetic mean of the given frequency distribution.

Marks	Frequency
50	3
28	4
85	6
40	7

(a) 52.6
(b) 40.95
(c) 50.5
(d) 56.2

Q82. In a triangle ABC, the lengths of its sides AB, AC and BC are 4 cm, 5 cm and 6 cm, respectively. An angle bisector AD is drawn from A onto BC, intersecting BC at D. Find m (BD), correct to two places of decimal.

(a) 2.67 cm
(b) 2.25 cm
(c) 1.50 cm
(d) 3.00 cm

Q83. Mango showers can be defined as:

(a) pre-monsoon showers which are common in the states of Karnataka and Kerala
(b) monsoon showers which are common in the states of Uttar Pradesh and Bihar
(c) Snow storms during the winter season
(d) post-monsoon showers which are common in the states of Maharashtra and Madhya Pradesh

Q84. Select the option that is related to the third term in the same way as the second term is related to the first term and the sixth term is related to the fifth term.

7 : 4096 :: 6 : ? :: 4 : 1

(a) 242
(b) 246
(c) 245
(d) 243

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Q85. Identify 'X' and 'Y' products respectively, in the given chemical equation.

NaOH + CH3COOH → 'X' + 'Y'

(a) CH3COONa and H2O
(b) CH3CO2H and Na(OH)2
(c) Na2OH and CO2
(d) NaO and CO2

Q86. Which of the following DOES NOT contain covalent bond?

(a) CH4
(b) NaOH
(c) NH3
(d) H2

Q87. The nature of the image formed behind the mirror, in case of a convex mirror is _____.

(a) virtual and inverted
(b) real and inverted
(c) virtual and erect
(d) real and erect

Q88. The 'NavIC' is an independent regional navigation satellite system being developed by which country?

(a) France
(b) India
(c) Russia
(d) Japan

Q89. Which of the following festivals is the mark of the triumph of Rama, an avatar of Vishnu, over the 10-headed demon king Ravana?

(a) Rakshabandhan
(b) Holi
(c) Ram Navmi
(d) Dussehra

Q90. This question is based on the five three-digit numbers given below.

423 875 652 246 168

(Example - 697- First digit = 6, second digit = 9 and third digit = 7)

What will be the resultant, if third digit of the second greatest number is added to the second digit of the smallest number?

(a) 11
(b) 13
(c) 8
(d) 10

Q91. In the given letter-cluster pairs, the first letter-cluster is related to the second letter-cluster following a certain logic.

Study the given pairs carefully, and from the given options, select the pair that follows the same logic.

ADG : EHK

TJF : XNJ

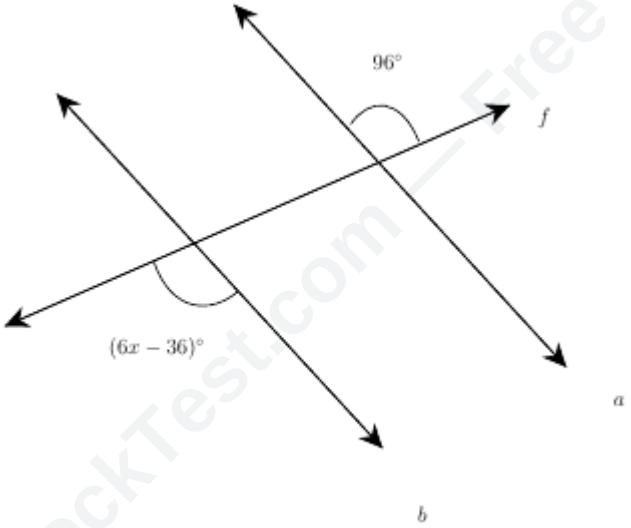
(a) KOH : OSL
(b) IPD : RKW
(c) JQR : NTV
(d) FJW : HLZ

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Q92. If $\sin^2 x + 3\cos^2 x = 2$, and $(0° < x < 90°)$, find the value of cosec x.

(a) $(2\sqrt{3})/3$
(b) $\sqrt{3}$
(c) $\sqrt{2}$
(d) 2

Q93. In the given figure, line a is parallel to line b. Find the value of x.



(a) 22°
(b) 36°
(c) 96°
(d) 32°

Q94. Puneet walks 4 m towards the west. He turns right and walks 7 m. He turns left and walks 4 m. He again turns left and walks 7 m. He turns right and walks 3 m. In which direction is he facing now? (All turns are 90 degree turns only)

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

Q95. A cross between a tall plant (TT) and short plant (tt) resulted in F1 progeny which were all tall plants because:

(a) The plant height is governed by T and t
(b) The plant height is governed by t only
(c) The plant height is governed by T only
(d) The plant height is governed by T or t

Q96. The budget of any government is defined as:

(a) an annual statement of the estimated receipts and expenditure of the government over the fiscal year
(b) a monthly statement of the estimated receipts and expenditure of the government over the last month
(c) a weekly statement of the estimated receipts and expenditure of the government over the last week
(d) a biennial statement of the estimated receipts and expenditure of the government over the last two fiscal years

Q97. Mr. X travelled 220 km, 250 km and 140 km at a speed of 11 km/h, 5 km/h and 7 km/h, respectively. Find his average speed in km/h.

(a) 6 7/9
(b) 6 5/9
(c) 7 7/9
(d) 6 2/9

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Q98. Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(22, 49, 568)

(25, 45, 560)

(a) (30, 15, 225)
(b) (15, 33, 240)
(c) (33, 38, 568)
(d) (18, 27, 225)

Q99. X people were given a contract for doing a piece of work in 15 days. 3 people did not turn up to work due to sickness, and the rest of the people completed the work in 20 days. What is the value of X?

(a) 12
(b) 15
(c) 10
(d) 14

Q100. The value of √(2+√(2+√(2 … … … … … … … … …))) is:

(a) 2.5
(b) 1.75
(c) 1.5
(d) 2

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) 35%

Shortcut Trick

Use the Successive Multiplication method for price change and weight fraud.

Price Ratio (CP : SP) = 25 : 27.

Weight Ratio (Quantity given : Quantity charged) = 800 : 1000 = 4 : 5.

Effective Ratio = (25 × 4) : (27 × 5) = 100 : 135.

Gain% = (135 − 100) ÷ 100 × 100 = 35%.

Therefore The correct answer is 35%.

Alternate Method

Given → CP per kg = Rs. 25, SP per kg = Rs. 27, True weight = 1000 g, Faulty weight = 800 g.

Formulas: Gain% = (Total SP − Total CP) ÷ Total CP × 100 | Total CP = CP × (Actual weight ÷ 1000).

=> Cost of 1000 g = Rs. 25. Therefore, Actual Cost of 800 g = (25 ÷ 1000) × 800 = Rs. 20.

=> The shopkeeper sells 800 g (which cost him Rs. 20) for the price of 1 kg (Rs. 27).

=> Selling Price obtained = Rs. 27.

=> Profit = SP − CP = 27 − 20 = Rs. 7.

=> Gain% = (7 ÷ 20) × 100 = 35%.

Therefore The correct answer is 35%.

Additional Information

Dishonest Dealer Concept

When a dealer uses less weight, the Gain% = [Error ÷ (True Value − Error)] × 100 if he sells at cost price.

Effective Profit

If there is a profit on price (P%) and a profit due to weight fraud, the total profit is calculated by compounding the ratios of investment to returns.

Q2. Answer: (d) Only conclusion I follows

Given Statements:

1. All flowers are white.

2. Some flowers are dark.

3. All darks are blue.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some whites are blue - True (Because, those parts of white which are flowers and part of dark, are also the part of is blue).

II. All darks are white - False (Because, only some parts of dark which are flowers, are also part of white, so this can be a possibility but not definite).

So, the only conclusion I follow.

Hence, the correct answer is "Option 4".

Q3. Answer: (d) India

The correct answer is India.

Key Points

• India won its maiden Thomas Cup title on 15 May 2022, beating 14-time champion Indonesia 3-0 in the final in Bangkok.

• World championships bronze medallist Lakshya Sen defeated Indonesia's Anthony Sinisuka Ginting 8-21, 21-17, 21-16 in the first men's singles to give India a 1-0 lead.

• India had previously reached the semifinals of the Thomas Cup in 1952, 1955, and 1979.

Additional Information

• The Thomas Cup, sometimes called the World Men's Team Championships, is an international badminton competition among teams representing member nations of the Badminton World Federation (BWF).

• The championships have been conducted every two years since 1982.

• The Uber Cup (first held in 1956–1957) is the world women's team championship.

Q4. Answer: (c) 49/25

Calculation:

((-5)/7)^(-6) ×((-5)/7)^4

=> ((-5)/7)^(-2)

=> $((-7)/5)^2$

=> 49/25

Therefore Option 3 is the correct answer.

Q5. Answer: (d) Information Technology Act, Right to Information Act, Right to Education Act, Right to Person with Disabili...

The correct answer is Information Technology Act, Right to Information Act, Right to Education Act, Right to Person with Disabilities Act

Key Points

• The correct order is:

• Information Technology Act - 2000

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• Right to Information Act - 2005

• Right to Education Act - 2009

• Right of Persons with Disabilities Act - 2016

Additional Information

• Information Technology Act (2000):

• The Information Technology Act, 2000 was one of the earliest significant legislations focusing on e-commerce, cyber laws, and the regulation of electronic transactions in India.

• It was enacted to provide legal recognition to electronic transactions and digital signatures.

• This Act forms the foundation for the legal framework surrounding the digital space in India.

• Right to Information Act (2005):

• The Right to Information Act, 2005 was introduced to ensure transparency and accountability in the functioning of government institutions.

• It empowers citizens to request information from public authorities and holds them accountable for their actions and decisions.

• This Act revolutionized citizen participation in governance.

• Right to Education Act (2009):

• The Right to Education Act, 2009 came into force to provide free and compulsory education to children aged 6-14 years.

• It guarantees the right of children to receive elementary education of a certain standard and promotes the involvement of children in schools.

• This Act was significant in promoting universal access to education.

• Right of Persons with Disabilities Act (2016):

• The Right of Persons with Disabilities Act, 2016 was enacted to ensure equal rights and opportunities for persons with disabilities in various spheres such as education, employment, healthcare, and social participation.

• It replaced the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, and broadened the scope of rights for differently-abled individuals.

Q6. Answer: (c) 1.0 cm

The correct answer is 1.0 cm

Key Points

• Given values:

• Object size (h0) = 3.0 cm

• Object distance (u) = -50 cm (negative because the object is on the left side of the lens)

• Focal length (f) = -25 cm (negative for a concave lens)

• Lens formula:

• 1/v = 1/f - 1/u

• Where 'v' is the image distance.

• 1/v = 1/(-25) - 1/(-50)

• 1/v = -1/25 + 1/50

• 1/v = (-2 + 1)/50

• 1/v = -1/50

• v = -50/3 cm = -16.67 cm

• Magnification formula:

• Magnification (M) = v/u = hi/h0

• Where 'hi' is the image size.

• M = (-50/3) / (-50)

• M = 1/3

• Image size:

• hi = M * h0

• hi = (1/3) * 3.0 cm

• hi = 1.0 cm

• So, the size of the image formed is 1.0 cm.

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Q7. Answer: (c) 2

Given Statement: S > W = T < L < O ≤ R

Now,

Conclusions:

1. W < R → True (W = T < L < O ≤ R It gives W < R)

2. S > L → False (S > W = T < L No relation can be established between S and L)

3. W < O → True (W = T < L < O It gives W < O)

4. T < S → True (S > W = T It gives S > T)

Here, Conclusion 2 NOT follows.

Hence, the correct answer is "Option 3".

Q8. Answer: (a) Sodium chloride

The correct answer is Sodium chloride

Key Points

• Sodium chloride can conduct electricity, but glucose, kerosene, and alcohol cannot.

• Sodium chloride is an ionic compound that conducts electricity when it's molten or dissolved in water.

• When dissolved in water, the sodium chloride dissociates into positively charged sodium ions and negatively charged chloride ions.

• These ions move freely in the solution, carrying a charge and allowing electricity to flow

Additional Information

• Ionic compounds have high melting and boiling points and conduct electricity in a molten state.

• Such a bond forms when the valence (outermost) electrons of one atom are transferred permanently to another atom. The atom that loses the electrons becomes a positively charged ion (cation), while the one that gains them becomes a negatively charged ion (anion).

Q9. Answer: (b) SAPGPGAQ

The logic followed here is:

Given Sequence: F G _ C _ I Q _ S F _ S C A I Q _ S F _ S C _ I _ P S

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

Option 1) SAPGBGAP → F G S C A I Q P S / F G S C A I Q B S / F G S C A I P P S

Option 2) SAPGPGAQ → F G S C A I Q P S / F G S C A I Q P S / F G S C A I Q P S

Here, 'FGSCAIQPS' followed a pattern.

Option 3) SAPGPGBQ → F G S C A I Q P S / F G S C A I Q P S / F G S C B I Q P S

Option 4) SAPFBFAP → F G S C A I Q P S / F F S C A I Q B S / F F S C A I P P S

Hence, the correct answer is "Option 2".

Q10. Answer: (c) 1998

The correct answer is 1998.

Key Points

• Maulana Azad National Urdu University (MANUU) was established by an Act of Parliament in 1998.

• It is a central university located in Hyderabad, Telangana.

• It was named after Maulana Abul Kalam Azad, who was a freedom fighter, an educationist, and the first Education Minister of independent India.

• The university is known for promoting Urdu language and literature.

• It has a dedicated Department of Urdu, which offers courses in Urdu language, literature, and culture.

• It has campuses in Hyderabad, Lucknow, and Srinagar.

• It also has centers in various cities across India.

Additional InformationMaulana Abul Kalam Azad:

• He was the nation's first minister of education from 1948 to 1958.

• He led the Khilafat movement from the front.

• He chose the pen name "Azad," which means "freedom," in order to distance himself from dogmatic religious beliefs.

• He fought for children's right to free education until the age of fourteen.

• He was also a pioneer in the establishment of India's higher education board, the University Grants Commission.

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Q11. Answer: (a) sodium

The correct answer is Sodium

Key Points

• Sodium reacts with chlorine to form sodium chloride (NaCl), which has a high melting point and is soluble in water.

• This reaction releases a large amount of heat and forms a stable ionic compound.

• Sodium chloride (NaCl) is highly soluble in water, which aligns with the compound described in the question.

• Sodium chloride has a relatively high melting point (~801°C), which matches the description of the compound having a high melting point.

Additional Information

• The melting point of a substance is the temperature at which it changes from a solid to a liquid.

• At this temperature, the solid and liquid phases of the substance exist in equilibrium

• The melting point of a substance depends on pressure and is usually specified at a standard pressure.

• During the melting process, the substance absorbs heat and the temperature remains constant.

• The melting point of a pure substance is a single temperature, but the melting point of a solution of two or more components is usually a range of temperatures.

• The melting point of a substance is a characteristic property of solid crystalline substances.

• The melting point of a substance is used to evaluate structural changes in organic compounds.

Q12. Answer: (a) These elements belong to the second period of the modern periodic table.

The correct answer is These elements belong to the second period of the modern periodic table.

• Atomic numbers 11 to 18 correspond to the elements:

• 11 - Sodium (Na), 12 - Magnesium (Mg), 13 - Aluminium (Al), 14 - Silicon (Si), 15 - Phosphorus (P), 16 - Sulfur (S), 17 - Chlorine (Cl), 18 - Argon (Ar).

• These elements all belong to the third period of the periodic table because their outermost electrons occupy the M shell (n=3).

• Hence The elements with atomic numbers 11 to 18 belong to the third period, not the second.

• The Modern periodic law & table was invented by Henry Moseley in 1913.

• The first who was able to arrange all the known elements was Mendeleev, he gave the law called the Mendeleev's periodic law.

• Dobereiner grouped the elements into triads.

• Newlands gave the law of octaves.

• Modern Periodic Table:

• The defects of the periodic table of Mendeleev were sorting out by Henry Moseley who invented the modern periodic law in 1913.

• The law of modern table states that - '' according to the increasing order of their atomic numbers if the elements are arranged, then the element's physical & chemical properties are repeated after regular intervals.

• Salient Features of the Modern Periodic Table:

• The element's properties are the functions that are periodical according to their atomic numbers.

• On the basis of the Modern table, Scientist Bohr invented a long form of the periodic table that was created by Warner& Rang.

• The periodic table consists of 18 groups & 7 periods.

• Division structure of elements with respective periods:

• According to the increasing order of their atomic numbers if the elements are arranged, then the element's physical & chemical properties are repeated after 2, 8, 18, and 32 intervals.

• There are 2 elements in the first period, 8 elements in second and third periods each respectively, 18 elements fourth and fifth periods each respectively, 32 elements in the sixth period, and 19 elements in the seventh period till now.

• Division structure of elements with respective periods(in Table format):

Table: Modern Periodic						
Periods	Stable Electronic Configuration	Number of Electrons	From	To		
First	1s2	2	| 6s24f14sd106p6 | | | --- | --- |	6s24f14sd106p6		He(2)
6s24f14sd106p6						

Second	2s22p6	8	Li(3)	Ne(10)		
Third	3s23p6	8	Na(11)	Ar(18)		
Fourth	4s23d104p6	18	K(19)	Kr(36)		
Fifth	5s24d105p6	18	Rb(37)	Xe(54)		
Sixth	6s24f14sd106p6	32	Cs(55)	Rn(86)		
Seventh	---	19	Fr(87)	Db(105)		

Q13. Answer: (d) SPUHU

We follow the given table and code the given combination:

Number/symbol	**3**	**#**	**6**	**4**	**@**	**$**	**7**	**2**	**%**	**5**	**=**	**9**	**8**
Code	T	H	J	K	M	P	U	D	U	E	W	V	S

Conditions	**Coded As**
If the first element is a symbol and the last, is a number	Codes for these two (the first and the last elements) are to be interchanged.
If the first element is an odd number and the last, is an even number	the first and last elements are to be coded as ©
If both the second and third elements are perfect squares	the third element is to be coded as the code for the second element.

Given combination: %$7#8

Here, Only the first condition followed in the given combination, none of the other conditions apply.

So, the first and the last elements are to be interchanged.

So, the code for '%$7#8' is → 'SPUHU'.

Hence, the correct answer is 'Option (4)'.

Q14. Answer: (a) A, B and D

The correct answer is A, B and D

Key Points

• The correct group of fundamental rights provided by the Constitution is:

• A. Right to equality

• B. Right to freedom of religion

• D. Right to constitutional remedies

• These rights are fundamental to safeguarding individual liberty and equality in India.

Additional Information

• A. Right to Equality

• This is a fundamental right guaranteed under Articles 14 to 18 of the Constitution. It includes:

• Equality before the law (Article 14).

• Prohibition of discrimination on grounds of religion, race, caste, sex, or place of birth (Article 15).

• Equality of opportunity in public employment (Article 16).

• Abolition of untouchability (Article 17).

• Abolition of titles (Article 18).

• B. Right to Freedom of Religion

• Guaranteed under Articles 25 to 28, this fundamental right ensures:

• Freedom of conscience and the right to freely profess, practice, and propagate religion (Article 25).

• Freedom to manage religious affairs (Article 26).

• Freedom from payment of taxes for promotion of any religion (Article 27).

• Freedom in attending religious instruction in educational institutions (Article 28).

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• Right to Constitutional Remedies
• This is a crucial fundamental right under Article 32.
• It empowers individuals to approach the Supreme Court or High Courts to enforce other fundamental rights if they are violated.
• Dr. B.R. Ambedkar described this as the "heart and soul" of the Constitution.
• Remedies include writs such as habeas corpus, mandamus, prohibition, certiorari, and quo warranto.

Q15. Answer: (b) SNMRKT

We follow the given table and code the given combination:

Number/symbol	$	3	@	8	%	2	#	&	6	ψ	π	7	5	φ
Code	A	V	L	K	R	M	B	F	N	T	E	C	S	W

Conditions	Coded As
If the first element is a symbol and the last element is a number	Codes for these two (the first and the last elements) are to be interchanged.
If the first element is an odd number and the last element is an even number	the first and last elements are to be coded as ©
If both the second and third elements are perfect squares	the third element is to be coded as the code for the second element

Given combination: ψ62%85
Here, Only the first condition followed in the given combination, none of the other conditions apply.
So, the First and last elements are to be interchanged.
So, the code for 'ψ62%85' is → 'SNMRKT'.
Hence, the correct answer is 'Option (2)'.

Q16. Answer: (d) Nylon

The correct answer is Nylon
Key Points
• Nylon is non-biodegradable, while cotton and wool are biodegradable
• Nylon
• A synthetic fiber that is non-biodegradable and cannot be broken down.
• Synthetic products are usually non-biodegradable because they are man-made.
• Washing machines can release microplastics from nylon into the environment.
Additional Information

Type of Waste	Approximate Time is taken to Degenerate	Nature of Material
Peels of vegetable and fruits, leftover foodstuff, etc.	1 to 2 weeks	Biodegradable
Paper	10 to 30 days	Biodegradable
Cotton cloth	2 to 5 months	Biodegradable
Wood	10 to15 years	Biodegradable
Woollen clothes	About a year	Biodegradable
Tin, aluminium, and other metal cans	100 to 500 years	Non-biodegradable
Plastic bags	Several years	Non-biodegradable
Synthetic fibre	Several years	Non-biodegradable

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Q17. Answer: (b) 3132

Shortcut Trick

Apply the divisibility rule of 9: A number is divisible by 9 if the sum of its digits is divisible by 9.

Check Option (2): 3132 → 3 + 1 + 3 + 2 = 9.

Since 9 is divisible by 9, the number 3132 is divisible by 9.

Therefore The correct answer is 3132.

Alternate Method

Given: Four numbers to check for divisibility by 9.

Rule: Sum of digits must be a multiple of 9.

=> Option (1): 2 + 3 + 5 + 2 = 12 (Not divisible by 9)

=> Option (2): 3 + 1 + 3 + 2 = 9 (Divisible by 9)

=> Option (3): 2 + 1 + 2 + 1 = 6 (Not divisible by 9)

=> Option (4): 1 + 0 + 9 + 9 = 19 (Not divisible by 9)

=> Only 3132 satisfies the condition.

Therefore The correct answer is 3132.

Additional Information

Divisibility by 3

A number is divisible by 3 if the sum of its digits is divisible by 3.

Divisibility by 11

Difference between the sum of digits at odd places and the sum of digits at even places must be 0 or a multiple of 11.

Divisibility by 6

The number must be even and the sum of its digits must be divisible by 3.

Q18. Answer: (a) Kilowatt hour

The correct answer is Kilowatt hour.

Key Points

• Kilowatt-hour

• Kilowatt-hour is the commercial unit of electric energy.

• kWh is a common unit of electrical energy (kilowatt-hour). It is defined as the amount of energy utilised for an hour by a 1kW appliance.

• The kilowatt-hour (abbreviated kWh) is a unit of energy that represents the energy used to generate one kilowatt of power for one hour.

• It is used to measure the amount of electricity consumed in homes, industries, and businesses.

Additional Information

• Although it is not a formal standard unit in any system, the kilowatt-hour is frequently employed in electrical applications.

• The unit of electrical energy is the kWh, which is the same for household and commercial use.

• Commercial units are charged at a separate rate than household units, which is higher.

• It is mostly used to reduce power usage in factories and other commercial settings.

Q19. Answer: (c) 8 cm

Shortcut Trick

Ratio of Length to Width is 3 : 1.

Sum of ratio parts = 3 + 1 = 4 units (representing half of the perimeter).

8 units (Full Perimeter) = 64 cm.

1 unit (Width) = 64 ÷ 8 = 8 cm.

Therefore The correct answer is 8 cm.

Alternate Method

Given:

Perimeter of Rectangle = 64 cm

Width (W) = 1/3 × Length (L)

Formula Used:

Perimeter = 2 × (Length + Width)

Calculations:

=> Let Length (L) = 3x and Width (W) = x

=> Perimeter = 2 × (3x + x) = 64

=> 2 × 4x = 64

=> 8x = 64

=> x = 64 ÷ 8 = 8

=> Width = x = 8 cm

Therefore The correct answer is 8 cm.

Additional Information

Area of Rectangle

The total space occupied by the rectangle is given by Area = Length × Width.

Diagonal of Rectangle

The distance between opposite corners is $d = \sqrt{(L^2 + W^2)}$.

Properties of Rectangle

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

Q20. Answer: (d) Two

Given: Seven boxes E, F, G, H, I, J and k are kept one over the other but not necessarily in the same order.

1) Only one box is kept above F.

2) Only three boxes kept between F and J.

3) K is kept immediately below of J.

F
J
K

4) Neither G nor I is kept at the top.

5) Only H is kept between G and I.

E
F
G/I
H
G/I
J
K

So, 'Two' are kept between H and K.

Hence, the correct answer is "Option 4".

Q21. Answer: (d) 4th floor

Given: P, Q, R, S and T live on five different floors of the same building.

The lowermost floor in the building is numbered 1, the floor above it, number 2 and so on till the topmost floor is numbered 5.

1) P lives on an odd numbered floor.

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

Floor	**Person**
5	

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4	T
3	P
2	S
1	

3) R is not on the lowermost floor.

Floor	Person
5	R
4	T
3	P
2	S
1	Q

So, 'T' lives on floor number 4.

Hence, the correct answer is "Option 4".

Q22. Answer: (a) It is called upper house of parliament and it never dissolves.

The correct answer is It is called upper house of parliament and it never dissolves.

Key Points

• Rajya Sabha:

• Rajya Sabha or the ‘Council of States’ is the second chamber of the Indian parliament, which traces its origin to the Montagu-Chelmsford Reforms, 1919.

• Rajya Sabha as the second chamber of the parliament intended to play certain roles as a permanent house.

• It never dissolves like Lok sabha.

• It is called upper house of parliament and it never dissolves.

• One-third of its members retire every two years, revisionary house (reconsidering bills passed by the Lok Sabha), and offers a degree of continuity in the underlying policies of laws passed by parliament..

• Its member shall not be less than 30 years of age.

Additional Information

• Representing the Vulnerable Sections:

• Women, religious, ethnic, and linguistic minority groups are not adequately represented in the Lok Sabha (due to first past the post-election system).

• An indirect form of election (through propositional representation) to the Rajya Sabha, therefore, would give them a chance to get involved in the nation’s law-making process.

• Thus, Rajya Sabha can make a place for people who may not be able to win a popular mandate.

• Special Powers of Rajya Sabha:

• The Upper House also has some special powers, such as:

• Power to transfer a subject from the State List to Union List for a specified period (Article 249).

• To create additional All-India Services (Article 312).

• To endorse Emergency under Article 352 for a limited period when the Lok Sabha remains dissolved.

Q23. Answer: (d) Council of Scientific and Industrial Research (CSIR)

The correct answer is the Council of Scientific and Industrial Research (CSIR)

Key Points

• The Shanti Swarup Bhatnagar Prize for Science and Technology is awarded annually by the Council of Scientific and Industrial Research (CSIR).

• Dr. Shanti Swarup Bhatnagar, is one of the most prestigious science awards in India.

• The award is given to scientists below the age of 45.

• It honours exceptional research contributions made in India during the last five years.

Additional Information

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Aspect	Indian Council of Medical Research (ICMR)	Department of Science and Technology (DST)	Department of Biotechnology (DBT)
Established	1911 (as Indian Research Fund Association), renamed ICMR in 1949	1971	1986
Parent Ministry	Ministry of Health and Family Welfare	Ministry of Science and Technology	Ministry of Science and Technology
Headquarters	New Delhi	New Delhi	New Delhi
Primary Focus	Biomedical research and public health	Promotion of science, technology, and innovation	Biotechnology research and development
Key Initiatives	National health programs, disease control, and public health policies	Funding research, science policy, and technology development	Biotech parks, vaccine development, and biotech innovation
Research Areas	Communicable and non-communicable diseases, reproductive health, and nutrition	Natural sciences, engineering, and technology	Genomics, proteomics, agriculture, and healthcare
Flagship Programs	Surveillance programs (e.g., NCDIR, NVBDCP)	INSPIRE (Innovation in Science Pursuit for Inspired Research), FIST	Biotech Ignition Grant (BIG), National Biopharma Mission

Q24. Answer: (b) Ammonia

The correct answer is Ammonia

Key Points

• Aquatic animals like fish excrete waste in the form of ammonia.
• Ammonia is a nitrogenous waste product that is excreted in a gaseous form
• Ammonia is a toxic waste product that is easily soluble in water.
• Aquatic animals excrete ammonia through their gills or across their body surface.
• Animals that excrete ammonia are called ammonotelic.

Additional Information

• Urea
• A nitrogenous waste product that's created when the liver converts ammonia.
• Urea is less toxic than ammonia and is eliminated in urine.
• Uric acid
• A nitrogenous waste product that's created when the body breaks down purines.
• Uric acid is found in blood and urine.
• High levels of uric acid can cause gout.
• Sweat salts
• Electrolytes like sodium, chloride, potassium, magnesium, and calcium that are found in sweat.
• Sweat is mostly water, but also contains salts.

Q25. Answer: (d) Mayor is the head of the Municipal Corporation.

The correct answer is Mayor is the head of the Municipal Corporation.

Key Points

• The Mayor is the ceremonial and administrative head of the Municipal Corporation
• He represents the city and presides over corporation meetings.
• The Mayor is the first citizen of the city.

Additional Information

• The number of member councilors in the municipal corporation varies from 40 to 85.
• Mayor and Councilor are elected directly.
• The number of Municipal Corporation is 16 in Madhya Pradesh.
• The Mayor in Council is the main committee of the Municipal Corporation.

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• The Mayor of this committee is the ex-officio chairman.

• The Municipal Council consists of ex-officio members of the Lok Sabha Rajya Sabha, six expert members are appointed by the Governor.

• Mayors are usually elected by the elected members of the Municipal Corporation or directly by the people, depending on the rules of the respective state.

• In some states, the Mayor's tenure is one year, while in others, it can be five years.

Q26. Answer: (b) 2

According to the given Venn diagram:

The shaded area shows the "the number of sour tasting yellow fruits".

So, the total number of 'the number of sour tasting yellow fruits' is 2.

Hence, the correct answer is "Option 2".

Q27. Answer: (d) Rs. 2.7 lakh crore

The correct answer is Rs. 2.7 lakh crore

Key Points

• India's GDP in 1947 was Rs. 2.7 lakh crore.

• some other economic facts about India on the eve of independence:

• Low growth

• India's economy grew very little from 1900 to 1947, with national income increasing by 0.4% per year and per capita income increasing by 0.1% per year.

• Low share of global GDP

• India's GDP was 16% of the global GDP in 1820, but by 1947 it had fallen to 4%.

• Agriculture-based economy

• India's economy was 95% dependent on agriculture, and 85% of the population lived in villages.

• Poor economic condition

• India's economy was in poor condition, with low employment rates, poverty, and a lack of opportunities.

• Exploitation

• The British exploited India's economy, rural areas, manufacturing, and other sectors.

• Poor agricultural practices

• The British did not use proper technologies, fertilizers, or irrigation equipment for agriculture.

Additional Information

• GDP of India

• According to the Press Information Bureau (PIB), here is some recent data on India's GDP:

• 2024-25

• Nominal GDP is estimated to be Rs. 77.31 lakh crore, a 9.7% increase from Q1 of 2023-24. Real GVA is estimated to be Rs. 40.73 lakh crore, a 6.8% increase from 2023-24.

• India's real GDP is projected to grow between 6.5–7%. The IMF has upgraded its GDP forecast to 7% for FY24-25.

• 2023-24

• Real GDP is estimated to be Rs. 173.82 lakh crore, an 8.2% increase from 2022-23. Nominal GDP is estimated to be Rs. 295.36 lakh crore, a 9.6% increase from 2022-23.

• The Central Statistics Office (CSO) releases six estimates of India's annual GDP over a period of two years and 10 months.

Q28. Answer: (b) Viktor Axelsen

The correct answer is Viktor Axelsen.

Key Points

• Viktor Axelsen won the All England Open Badminton Championship Men's Singles 2020 title.

• The championship was held in Birmingham, England.

• It was a part of the All England Open championships, which had been held since 1899.

• In the women's category, Tai Tzu-Ying won the championship.

• Viktor Axelsen is a Danish badminton player. He is the 2017 World champion and the 2020 Olympic champion.

• He won the 2010 World Junior Championships, beating South Korea's Kang Ji-Wook in the final to become the first-ever European player to hold the title.

Additional Information

• Lakshya Sen

• Lakshya Sen is an Indian badminton player.

• He's a former World Junior No. 1. Sen is a bronze medalist at the World Championships, a gold medalist at the Thomas Cup, a silver medalist at the Asian Games and a gold and silver medalist at the Commonwealth Games

• He has also won bronze medals at the Asia Team and Asia Mixed Team Championships. Sen won the Canada Open and was the runner-up at the All England Open.

• At the junior level, he has won a gold and silver medal at the Youth Olympic Games, a bronze medal at World Junior Championships and a gold and bronze medal at Asia Junior Championships.

• Kidambi Srikanth

• Kidambi Srikanth is an Indian badminton player.

• He was ranked no. 1 player in men's singles in the world in April 2018

• He was conferred with Padma Shri award in 2018

• He was also conferred with Arjuna award in 2015.

Q29. Answer: (a) a - 3, b - 4, c - 2, d - 1

The correct answer is a - 3, b - 4, c - 2, d - 1

Key Points

	Column-A (City)		Column-B (River)
a.	Ahmedabad	3	Sabarmati
b.	Kolkata	4	Hooghly
c.	Guwahati	2	Brahmaputra
d.	Nasik	1	Godavari

Hence the correct matching is a - 3, b - 4, c - 2, d - 1

Additional Information

• 1.Ahmedabad → Sabarmati

• Ahmedabad, a major city in Gujarat, is located on the banks of the Sabarmati River.

• The Sabarmati Riverfront project in Ahmedabad is a notable development along this river.

• 2. Kolkata → Hooghly

• Kolkata, the capital city of West Bengal, lies along the Hooghly River, which is a distributary of the Ganges.

• The iconic Howrah Bridge and Vidyasagar Setu span this river, making it integral to the city's identity.

• 3. Guwahati → Brahmaputra

• Guwahati, the largest city in Assam, is situated on the southern banks of the mighty Brahmaputra River.

• This river is one of the major rivers in India and is central to the culture and economy of Assam.

• 4. Nasik → Godavari

• Nasik, a city in Maharashtra, is located on the banks of the Godavari River, the second-longest river in India.

• It is also a significant pilgrimage site, known for hosting the Kumbh Mela on the riverbanks.

Q30. Answer: (b) 64

Given:

2.33 - 4.12 + 6.13 × 11.3 = ?

Concept used:

Calculation:

2.33 - 4.12 + 6.13 × 11.3 = ?

=> 2 - 4 + 6 × 11 = ?

=> -2 + 66

=> 64

The closest approximate value is 64.

Q31. Answer: (b) 54

Given:

3.013 ÷ 2.99 × 6.01 = ?

Concept used:

Calculation:

3.013 ÷ 2.99 × 6.01 = ?

=> $3^3 \div 3 \times 6$

=> $3^2 \times 6$

=> 9 × 6

=> 54

The closest approximate value is 54.

Q32. Answer: (d) 3

Given:

216 2/n = 36.

Calculation:

216 2/n = 36.

=> 6 3× 2/n = 6^2

=> 6/n = 2

=> n = 3

Therefore Option 4 is the correct answer.

Q33. Answer: (a) direction of current

The correct answer is the direction of current

Key Points

• The polarity of an electromagnet can be reversed by changing the direction of the electric current passing through it.

• The strength of an electromagnet can be increased by increasing the number of turns of wire in the coil or by increasing the current in the coil.

• The direction of the current flowing through the electromagnet determines its polarity.

• Reversing the direction of the current reverses the polarity of the electromagnet.

Additional Information

• An electromagnet is a temporary magnet that should ideally have the property to behave as a magnet when current passes through it and lose magnetism as soon as the current is stopped.

• Soft iron is generally used for making electromagnets because it has high magnetic permeability, i.e. it can easily gain magnetic properties when current is passed around the core and quickly lose when the current is stopped.

• The soft iron inside the coil makes the magnetic field stronger because it becomes a magnet itself when the current is flowing

Q34. Answer: (b) 108°

Calculation:

Expense of a family on fuel = 7%

Expense of a family on miscellaneous = 12%

Expense of a family on investment = 11%

Total expense = 7 + 12 + 11 = 30%

Central angle for total expenditure on fuel, miscellaneous and investment = 30/100 × 360 = 108°

Therefore Option 2 is the correct answer.

Q35. Answer: (c) 7.005, 7.050, 7.500, 70.50, 75, 705.0, 7050

Given number: 705.0, 7.005, 7.500, 70.50, 7050, 7.050, 75

After arranging in ascending order:

7.005, 7.050, 7.500, 70.50, 75, 705.0, 7050

Hence, the correct answer is 'Option 3'.

Q36. Answer: (d) short run production

The correct answer is Short-run Production

Key Points

• The production cycle in which at least one factor of production remains constant is called the short run.

• The law of returns to a factor explains such a production function

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• A short-run production function refers to that period of time, in which the installation of new plant and machinery to increase the production level is not possible.

• The production function can be described as the operational relationship between the inputs and outputs, in the sense that the maximum amount of finished goods that can be produced with the given factors of production, under a particular state of technical knowledge.

• There are two kinds of the production function, short run production function and long run production function.

• The short run production function is one in which at least is one factor of production is thought to be fixed in supply, i.e. it cannot be increased or decreased, and the rest of the factors are variable in nature.

Additional Information

• Variable long term production

• It is a production process where all inputs are variable, meaning they can be adjusted.

• This allows companies to optimize their production process and maximize output.

• Long run production

• The long-run production function shows the most efficient way to produce any level of output.

• The long-run average total cost curve is also the long-run production cost curve.

• constant long term production

• Constant long-term production is a situation where a firm's output remains the same over a long period of time.

• This can happen when a firm's production function is such that it experiences constant returns to scale.

Q37. Answer: (a) 2,046

Shortcut Trick

Outer surface area of an open cuboid = Lateral Surface Area + Base Area.

Area = 2h(l + b) + lb = 2 × 1.5 × (4 + 3.6) + (4 × 3.6).

Area = 3 × 7.6 + 14.4 = 22.8 + 14.4 = 37.2 m².

Cost = 37.2 × 55 = Rs. 2046.

Therefore The correct answer is Rs. 2,046.

Alternate Method

Given:

Length (l) = 4 m, Breadth (b) = 3.6 m, Depth (h) = 1.5 m

Rate of painting = Rs. 55 per m²

Calculations:

=> Surface area to be painted = Area of 4 walls + Area of base

=> Surface area = [2 × h × (l + b)] + [l × b]

=> Surface area = [2 × 1.5 × (4 + 3.6)] + [4 × 3.6]

=> Surface area = [3 × 7.6] + 14.4

=> Surface area = 22.8 + 14.4 = 37.2 m²

=> Total Cost = Total Area × Rate

=> Total Cost = 37.2 × 55 = Rs. 2046

Therefore The correct answer is Rs. 2,046.

Additional Information

Total Surface Area of Cuboid

The total surface area of a closed cuboid is 2(lb + bh + hl).

Lateral Surface Area (Area of 4 walls)

The area of the vertical faces of a cuboid is 2h(l + b).

Volume of Cuboid

The capacity or space occupied by a cuboid is given by Length × Breadth × Height.

Q38. Answer: (b) 48π cm2

Shortcut Trick

Total Surface Area (TSA) of a cylinder is given by 2πr(r + h).

Given radius (r) = 2 cm and height (h) = 10 cm.

TSA = 2 × π × 2 × (2 + 10)

TSA = 4 × π × 12 = 48π cm².

Therefore The correct answer is 48π cm².
Alternate Method
Given:
Radius (r) of the cylinder = 2 cm
Height (h) of the cylinder = 10 cm
Formula Used:
Total Surface Area = Curved Surface Area + 2 × Area of Base
Total Surface Area = 2πrh + 2πr² = 2πr(h + r)
Calculations:
=> Total Surface Area = 2 × π × 2 × (10 + 2)
=> Total Surface Area = 4π × 12
=> Total Surface Area = 48π cm²
Therefore The correct answer is 48π cm².
Additional Information
Curved Surface Area of Cylinder
The area of the side surface excluding the top and bottom bases is given by 2πrh.
Volume of Cylinder
The total space occupied by the cylinder is calculated using the formula V = πr²h.
Area of Circular Base
Each base of a right circular cylinder is a circle with an area equal to πr².

Q39. Answer: (b) 41

Calculation:
The average ticket sold on Monday, Tuesday and Wednesday was 31.
The tickets sold on Monday were 28.
The tickets sold on Tuesday were 24.
Total tickets = 31 × 3 = 93
Tickets sold on Wednesday = 93 - (28 + 24) = 41.
Tickets sold on Wednesday were 41.

Q40. Answer: (a) 30

Shortcut Trick
Age difference remains constant throughout life.
5 years ago, Ratio of ages (Arun : Kiran) = 5 : 1
Difference in ratio parts = 5 − 1 = 4 units → 20 years
1 unit = 5 years => Arun's age 5 years ago = 5 × 5 = 25 years
Present age of Arun = 25 + 5 = 30 years.
Therefore The correct answer is 30 years.
Alternate Method
Let the present age of Kiran be x years.
Since Arun is 20 years elder, Arun's present age = x + 20 years.
According to the problem, 5 years ago:
=> (Arun − 5) = 5 × (Kiran − 5)
=> (x + 20 − 5) = 5(x − 5)
=> x + 15 = 5x − 25
=> 4x = 40
=> x = 10 years (Kiran's age)
=> Arun's present age = x + 20 = 10 + 20 = 30 years.
Therefore The correct answer is 30 years.
Additional Information
Constant Age Difference
The difference between the ages of two people remains the same regardless of how many years pass.

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Ratio of Ages

If the age ratio is given for different time periods, convert them to a common scale using the constant difference property.

Linear Equations in Ages

For 'n' years ago, subtract 'n' from present ages; for 'n' years hence, add 'n' to present ages.

Q41. Answer: (a) 3

Given statements: P < Q ≤ R < S > T ≥ U > V

Now,

Conclusions:

1) T > V → True (T ≥ U > V it gives T > V)

2) P < R → True (P < Q ≤ R it gives P < R)

3) S ≥ V → Not True (S > T ≥ U > V it give S > V, not S ≥ V)

4) Q < S → True (Q ≤ R < S it gives Q < S)

Here, Conclusion 3 follows.

Hence, the correct answer is "Option 1".

Q42. Answer: (d) At the topmost position

Given: Six boxes M, N, O, P, Q, and R are kept one above the other.

1) Only 2 boxes are kept below M.

> > M > > __

2) Only one box is kept above Q.

Q > > M > >

3) O is kept at any of the positions above R but not at the topmost position.

4) R is not kept at the bottommost position.

Q > O > M > R >

5) N is kept at any of the positions below Q.

__ > Q > O > M > R > N

So, P will be kept at the topmost position.

P > Q > O > M > R > N

Hence, the correct answer is "Option 4".

Q43. Answer: (a) un-deviated

The correct answer is un-deviated

Key Points

• The emergent ray from the optical center of a lens will be un-deviated.

• This means that the ray will pass through the lens without changing direction.

• The optical center is the center of the lens.

• A ray of light passing through the optical center of a lens will emerge without any deviation after refraction.

• This means that the path of the ray will not change

Additional Information CONCEPT:

• All the cases for the ray of light emanating from the source and refracting through a convex lens are shown in the table:

Q44. Answer: (c) 11

The correct answer is 11

Key Points

• In August 2022, 11 districts of West Bengal were included in the 'Combating Child Trafficking' campaign.

• These districts were chosen based on their higher prevalence of child trafficking cases and other socio-economic factors that contributed to the vulnerability of children to trafficking.

• The campaign was a collaborative effort involving multiple stakeholders, including government agencies, NGOs, and law enforcement, to strengthen child protection measures and ensure the safety and well-being of children.

• The 'Combating Child Trafficking' campaign in West Bengal, launched in August 2022,

• It aimed at addressing and preventing child trafficking in specific vulnerable districts.

Additional Information The 11 districts included were:

1. South 24 Parganas
2. East Midnapore
3. West Midnapore
4. North 24 Parganas
5. Cooch Behar
6. Darjeeling
7. Jalpaiguri
8. Malda
9. Murshidabad
10. Birbhum
11. Bankura

These districts were targeted to implement strategies like community engagement, better surveillance, legal interventions, and coordination among different stakeholders to combat child trafficking effectively.

Q45. Answer: (c) Na2SO4 + BaCl2 → BaSO4 + 2NaCl

The correct answer is Na2SO4 + BaCl2 → BaSO4 + 2NaCl

Key Points

• The reaction Na2SO4 (aq) + BaCl2 → BaSO4 (s) + 2 NaCl (aq) + 2 NaCl (aq) is the example of Double displacement reaction.

• The reaction between Na2SO4 + BaCl2 is an endothermic reaction.

• When barium chloride (BaCl2) and sodium sulfate (Na2SO4), which leads to the formation of sodium chloride and barium sulphate.

• As a result of the above-given reaction, a white colour precipitate is formed due to the formation of barium sulphate.

• Na2SO4 (aq) + BaCl2 → BaSO4 (s) + 2 NaCl (aq) + 2 NaCl (aq)

• As the white precipitate formed is cool, the given reaction is inferred to be an endothermic reaction.

• This reaction is also an example of a double displacement reaction as two elements in the reactants are displacing each other.

Additional Information Other types

• Addition reaction :

• An addition reaction occurs when two or more reactants combine to form a product without the loss of any atoms present in the reactants.

• Addition reaction is common in compounds that have unsaturated C-C bonds, like double (alkene) and triple (alkyne) bonds.

• The weaker π bond is converted into two new stronger bonds.

• Reduction reaction :

• Redox is a type of chemical reaction in which the oxidation states of atoms are changed.

• Redox reactions are characterized by the actual or formal transfer of electrons between chemical species, most often with one species undergoing oxidation while another species undergoes reduction.

• Decomposition reaction :

• A decomposition reaction is a reaction in which a compound breaks down into two or simpler substances.

• The general form of a decomposition reaction is:

• AB→A+B. Most decomposition reactions require an input of energy in the form of heat, light, or electricity.

Q46. Answer: (a) 84

The logic followed here is:

So, '84' is the missing number in the given series.

Hence, the correct answer is "Option 1".

Q47. Answer: (c) Five

Given series:

9 2 3 5 7 8 6 3 2 1 5 6 7 9 4 3 6 3 5 8 2

Condition to be checked:

Odd Number → Even Number → Odd Number

(Left) 9 2 3 5 7 8 6 3 2 1 5 6 7 9 4 3 6 3 5 8 2 (Right)

Thus, there are five such patterns that satisfy the given conditions: (9 2 3), (3 2 1), (5 6 7), (9 4 3) and (3 6 3)

Hence, the correct answer is "Option (3)".

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Mistake Points

Immediately preceded by means to come just before.

Immediately followed by means to come just after.

Q48. Answer: (a) 9

Logic: (1st numbers × 3) ÷ 5 = 2nd number.

Now,

For, 25 : 15

=> (25 × 3) ÷ 5

=> 75 ÷ 5 = 15

15 = Second Number.

Similarly, for 15 : x

=> (15 × 3) ÷ 5

=> 45 ÷ 5 = 9.

=> x = 9.

So, 9 will be the value of x.

Hence, the correct answer is "Option 1".

Q49. Answer: (a) 8 years

Shortcut Trick

Difference in ages is constant: 48 − 32 = 16 years.

Ratio was 5 : 3, difference in ratio parts = 5 − 3 = 2 units.

2 units = 16 years => 1 unit = 8 years.

Roja age then: 3 units × 8 = 24 years.

Years ago = 32 − 24 = 8 years.

Therefore The correct answer is 8 years.

Alternate Method

Given: Current age of Hema = 48 years, Current age of Roja = 32 years.

Let x years ago the ratio was 5 : 3.

=> (48 − x) / (32 − x) = 5 / 3

=> 3 × (48 − x) = 5 × (32 − x)

=> 144 − 3x = 160 − 5x

=> 5x − 3x = 160 − 144

=> 2x = 16

=> x = 8 years

Therefore The correct answer is 8 years.

Additional Information

Age Difference Property

The difference between the ages of two people remains constant at any point in time.

Ratio Balancing

To solve age ratios quickly, ensure the numerical difference between ratio parts matches the actual age difference.

Proportion Rule

If a/b = c/d, then cross-multiplication (ad = bc) is the standard algebraic way to find the unknown variable.

Q50. Answer: (b) P

Given word: 'REASON'

After changing each vowel to the letter following it in the English alphabetical order and each consonant to the letter preceding it in the English alphabetical order:

Alphabets	**R**	**E**	**A**	**S**	**O**	**N**
After Changing	Q	F	B	R	P	M

Now, after arranged in alphabetical order:

Alphabets	Q	F	B	R	P	M
Alphabetical Order	B	F	M	P	Q	R

So 'P' will be fourth from the left.

Hence, the correct answer is "Option 2".

Q51. Answer: (a) Param

Given: Six students are sitting around a circular table facing the centre.

1. Taran is an immediate neighbour of Karam and Viraj.

2. Param is sitting second to the right of Taran.

3. Sunny is an immediate neighbour of Param and Manjit.

4. Karam is sitting second to the right of Sunny.

Here, Param is the immediate neighbour of Sunny and Viraj.

Hence, the correct answer is "Option 1".

Q52. Answer: (b) 4

The logic followed here is:

Thus, '4' will replace the question mark in the given series.

Hence, the correct answer is "Option 2".

Q53. Answer: (c) None of the conclusions definitely follow.

Statements:

1. Some classical dancers are students.

2. Rama is a classical dancer.

3. Sohan is a student of class X.

Conclusion:

(I) Sohan is not a classical dancer - Doesn't follow (Because there are some students who are classical dancers but it is not clearly mentioned that the students are of X class).

(II) Rama is a student - Doesn't follow (Because it is clearly mentioned in the given statements that rama is a classical dancer but it is not definite that whether rama is a student or not).

Thus, none of the conclusions definitely follow.

Hence, the correct answer is "Option 3".

Q54. Answer: (a) 4.0 m

The correct answer is 4.0m

Key Points

• The radius of curvature (R) of a spherical mirror is related to its focal length (f) by the following equation:

• R = 2f

• In this case, the focal length (f) of the convex mirror is given as 2 m.

• Therefore, the radius of curvature (R) is:

• R = 2 * 2 m = 4 m

• So, the correct answer is 4.0 m.

Important Points

• Spherical Mirrors and Their Properties

• Concave Mirror: A concave mirror curves inwards, like the inside of a spoon. It can focus light rays to a single point.

• Convex Mirror: A convex mirror curves outwards, like the back of a spoon. It diverges light rays, making objects appear smaller and providing a wider field of view.

• Key Terms

• Focal Length (f): The distance between the mirror's surface and its focal point (the point where parallel light rays converge after reflection in a concave mirror, or appear to diverge from in a convex mirror).

• Radius of Curvature (R): The radius of the sphere from which the mirror is a part. It's the distance between the mirror's surface and the center of curvature (the center of that sphere).

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Q55. Answer: (d) By dialysis

The correct asnwer is By dialysis.

Q56. Answer: (a) MRI scan

The correct answer is MRI scan

Key Points

• The process of obtaining images of different body parts by using a weak magnetic field produced inside the body is called Magnetic Resonance Imaging (MRI).

• MRI is a non-invasive medical imaging technique that uses radio waves and a strong magnetic field to create images of the body's internal structures.

• MRI scanners are large, tube-shaped magnets.

• MRI is often used to diagnose disease, plan treatment, and monitor the effectiveness of treatment.

• MRI is especially useful for imaging the brain, spinal cord, heart, blood vessels, bones, joints, and soft tissues.

Additional Information

• Ultrasound scan

• An ultrasound scan, also known as a sonogram, is a non-invasive procedure that uses high-frequency sound waves to create images of the inside of the body.

• It can be used to diagnose conditions, monitor fetal development, or guide surgeons during certain procedures.

• PET scan

• A PET (positron emission tomography) scan is a medical imaging procedure that uses a radioactive tracer to create 3D images of the inside of the body.

• PET scans involve radiation exposure.

• The amount of radiation is usually less than that received from natural sources like the sun.

• However, pregnant women shouldn't undergo a PET scan unless necessary.

• CT Scan

• A CT scan, or computed tomography scan, is a medical imaging procedure that uses X-rays and a computer to create detailed pictures of the inside of the body.

• CT scans can be used to diagnose disease, plan treatment, and evaluate how well treatment is working.

Q57. Answer: (a) Odisha

The correct answer is Odisha

Key Points

• The Mahanadi River is a major river in East Central India, predominantly flowing through the state of Odisha.

• It covers a total drainage area of 141,600 square kilometres and has a course of 858 kilometres.

• It is the third largest river in terms of water potential and drainage area in the Indian peninsula after the Godavari and the Krishna rivers.

• In Odisha, it's the largest river and holds great economic significance for the state as it supports agriculture, industry, and the daily lives of people.

• Some of the most significant rivers in the region include the Seonath, Hasdeo, Mand, Jonk, Telen, and Ib.

• The Mahanadi river system is known for the Hirakud Dam.

• This dam is one of the longest in the world and serves a critical purpose in flood control and providing irrigation water.

Additional Information

Major River	Important Tributaries
Ganga	Yamuna, Son, Kosi, Gandak, Gomti, Ghaghara, Damodar
Brahmaputra	Dibang, Lohit, Siang, Manas, Teesta
Godavari	Pravara, Purna, Manjira, Sabari
Krishna	Bhima, Tungabhadra, Malaprabha, Ghataprabha
Mahanadi	Seonath, Hasdeo, Mand, Jonk, Telen, Ib
Narmada	Banjar, Tawa, Barna, Shakkar
Yamuna	Chambal, Sindh, Betwa, Ken

Tapti	Purna, Girna, Panzara, Bori, Aner
Kaveri	Hemavati, Shimsha, Arkavathy, Kabini

Q58. Answer: (a) -, +, ÷, =, ×, +

Given: 32 * 16 * 8 * 2 * 3 * 5 * 5

Checking the given options:

Option 1) -, +, ÷, =, ×, +

=> 32 - 16 + 8 ÷ 2 = 3 × 5 + 5

=> 32 - 16 + 4 = 15 + 5

=> 36 - 16 = 20

=> 20 = 20.

L.H.S = R.H.S

Here, the equation is satisfied.

Option 2) +, -, ÷, ×, =, +

=> 32 + 16 - 8 ÷ 2 × 3 = 5 + 5

=> 32 + 16 - 12 = 10

=> 48 - 12 = 10

=> 36 ≠ 10.

Here, the equation is not satisfied.

Option 3) -, +, ÷, ×, =, +

=> 32 - 16 + 8 ÷ 2 × 3 = 5 + 5

=> 32 - 16 + 12 = 10

=> 44 - 16 = 10

=> 28 ≠ 10.

Here, the equation is not satisfied.

Option 4) -, +, ×, =, ÷, +

=> 32 - 16 + 8 × 2 = 3 ÷ 5 + 5

=> 32 - 16 + 16 = 3 ÷ 5 + 5

=> 48 - 16 = 0.6 + 5

=> 32 ≠ 5.6.

Here, the equation is not satisfied.

Hence, the correct answer is "Option 1".

Q59. Answer: (c) 17th

The correct answer is 17th.

Key Points

• The Halogens are the elements belonging to Group 17 in the periodic table.

• A periodic table is an arrangement of elements based on their atomic numbers and chemical properties.

• It is divided into 18 groups and 7 periods running vertically and horizontally respectively.

• The periodic table accommodates a discrete combination of metal, non-metals, and metalloids.

• The elements in the periodic table are arranged horizontally in ascending order of their atomic numbers known as periods.

• Vertically the elements having identical chemical properties are clubbed together known as groups.

• The 18 groups are also known as columns and the 7 periods are also known as the rows.

Additional InformationPeriods:

• Elements are arranged in increasing the atomic number of elements in a period.

• One extra electron gets added to the outermost shell as we move along the periods from left to right.

• The electron gets added to the same shell or orbit and thus the electrons present for bonding increase by one unit.

• Thus, the shell number remains the same but the number of electrons present for bonding increases along a period.

Groups:

• Elements having the same number of outer electrons are put in the same group of the periodic table.

• When we move down a group, new shells get added.

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• The outermost shell has electrons present for bonding.

• Though the number of shells increases as we go down in a group, the number of electrons in the outermost shell remains the same.

• For example, the Halogens F, Cl, Br, I, At all belong to group 17 and have 7 electrons in the outermost shell.

• Similarly, Group 16 elements have 6 electrons in the outermost shell, group 15 has 5 electrons in the outermost shell, and so on.

Group number	Common name	Number of electrons for bonding
1	Alkali metals	1
2	Alkaline earth metals	2
14	Crystallogens	4
15	Pnictogens	5
16	Chalcogens	6
17	Halogens	7
18	Noble gases	8

Hence, group 17 is called halogens.

Q60. Answer: (a) I weakens, while II strengthens the statement

Given:

Statement:

Kids should be allowed to use mobile phones from an early age.

Now,

Arguments:

I. Continuous use of mobile phone causes distraction for the kids - False (As the statement clearly mentioned that kids should be allowed to use mobile phone. So, any negative point will weaken the given statement).

II. A lot of educational apps encourage playful competition among kids while enhancing the way they learn new ideas - True (There are lots of educational app which can help the kids to enhance there learning ability from a very early age and this argument is strengthening the given statement).

Hence, the correct answer is "Option 1".

Q61. Answer: (a) 8 : 35

Given: The mirror image of a 12-hour clock is 3 : 25.

Now, the actual time is:

Hence, the correct answer is "Option 1".

Q62. Answer: (b) Carbon

The correct answer is Carbon

Key Points

• Graphite is a non-metal which is a good conductor of both heat and electricity.

• It is an allotrope of carbon, other allotropic forms being diamond, amorphous carbon, etc.

• The conductive properties of graphite come from its unique structure.

• It is composed of layers of carbon atoms arranged in a hexagon lattice.

• These layers are weakly bonded so they can slide over one another, which is why graphite is also used as a lubricant.

• Furthermore, within these layers, each carbon atom is only bonded to three others.

• This leaves one free electron, which can move within the layer.

• This mobility of electrons allows for the conduction of electricity.

Additional Information

• Sulfur

• Sulfur is a chemical element; it has symbol S and atomic number 16.

• It is abundant, multivalent and nonmetallic.

• Under normal conditions, sulfur atoms form cyclic octatomic molecules with the chemical formula S8.

• Elemental sulfur is a bright yellow, crystalline solid at room temperature.

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• Phosphorus:

• Phosphorus is a non-metal, yet it does not conduct electricity or heat very well.

• Its atomic structure doesn't allow for the free movement of electrons which is essential for conductivity.

Q63. Answer: (b) Sardar Sarovar Dam

The correct answer is Sardar Sarovar Dam.

Key Points

• Narmada Bachao Andolan is the most powerful mass movement, started in 1985, against the construction of a huge dam on the Narmada river.

• Narmada Bachao Andolan (NBA) is an Indian social movement initiated by native tribals (Adivasis), farmers, environmentalists, and human rights activists. The river flows through the states of Gujarat, Madhya Pradesh, and Maharashtra.

• Sardar Sarovar is the project related to Narmada Bachao Andolan.

• Medha Patkar and Baba Amte are associated with Narmada Bachao Andolan.

Important Points

• Narmada is the largest west flowing peninsular river in India.

• Narmada river originates from Amarkantak Plateau, Madhya Pradesh.

• It drains into the Arabian Sea through the Gulf of Khambhat.

• Major tributaries of the Narmada river are:

• Hiran river.

• Tendoni river.

• Kolar river.

• Hatni river.

• Orsang river.

• Tawa river.

• Barna river.

Additional Information

Dam	River
Nagarjuna Sagar Dam	Krishna River
Tehri Dam	Bhagirathi River
Hirakud Dam	Mahanadi River

Q64. Answer: (b) 9 : 11

Shortcut Trick

Difference in Present ratio (4 : 5) is 1. Difference in Past ratio (10 : 13) is 3.

Equalize differences by multiplying present ratio by 3 → 12 : 15.

Change in units: 12 − 10 = 2 units. Given: 2 units = 4 years => 1 unit = 2 years.

Present ages: 12 × 2 = 24 and 15 × 2 = 30. After 3 years: 27 : 33 = 9 : 11.

Therefore The correct answer is 9 : 11.

Alternate Method

Given: Present ratio of Arjun and Dharma = 4 : 5. Ratio 4 years ago = 10 : 13.

Formula Used: Ratio = (Initial Value ± Change) / (Initial Value ± Change)

=> Let the present ages be 4x and 5x.

=> 4 years ago, ages were (4x − 4) and (5x − 4).

=> (4x − 4) / (5x − 4) = 10 / 13

=> 13 × (4x − 4) = 10 × (5x − 4)

=> 52x − 52 = 50x − 40

=> 2x = 12 => x = 6

=> Arjun's present age = 4 × 6 = 24 years.

=> Dharma's present age = 5 × 6 = 30 years.

=> After 3 years, Arjun's age = 24 + 3 = 27 years.

=> After 3 years, Dharma's age = 30 + 3 = 33 years.

=> Required Ratio = 27 : 33 = 9 : 11.

Therefore The correct answer is 9 : 11.

Additional Information

Ratio Balancing Method

To solve age problems quickly, multiply the ratios so that the numerical difference between the parts of the two ratios becomes equal to the actual time gap.

Difference Invariance

The age difference between two people remains constant throughout their lives. If A is 5 years older than B now, A will be 5 years older than B after n years.

Cross-Multiplication Method

For two ratios A:B and C:D with a constant change k, use |(A×D) − (B×C)| units = |(C−D)| × k.

Q65. Answer: (d) shows null deflection

The correct answer is shown null deflection

Key Points

• In electromagnetic induction, a current is induced in a coil only when there is a relative motion between the coil and the magnetic field, causing a change in magnetic flux.

• If both the coil carrying current and the magnetic field are stationary,

• there is no change in magnetic flux, and thus the galvanometer shows no deflection (null deflection).

• Electromagnetic Induction: Electric current is induced in the closed conductor if the magnetic flux associated with it changes.

• Magnetic Flux: The product of magnetic field and area is called magnetic flux.

• The change in magnetic flux can be changed by change in field or associate area.

Additional Information

• The theory of Electromagnetic Induction by Faraday.

• He concluded that the rate of change in flux is gives the emf of the coil.

$E = (\Delta \varphi)/(\Delta t)$

• Lenz law related this to the conservation of energy.

• According to this law, the emf will be induced in a coil due to a changing magnetic flux in such a way that it will oppose the cause which has produced it.

• This law states that the induced emf in a conductor due to a changing magnetic flux is such that the magnetic field created by the induced emf opposes the change in a magnetic field.

=> $emf=-N (d\varphi/dt)$

where N = number of loops and $d\varphi$ = Change in magnetic flux

• The above equation is given by Faraday's law, but the negative sign is a result of Lenz's law.

Q66. Answer: (b) Reports of National Family Health Survey

The correct answer is Reports of National Family Health Survey

Key Points

• Reports of the National Family Health Survey (NFHS) are not a source of formal data on unemployment in India.

• The NFHS is a survey that provides data on health and family welfare.

• It Primarily focuses on health, nutrition, and population metrics rather than employment or unemployment data

• A survey conducted by the Ministry of Statistics and Programme Implementation to collect data on unemployment

Additional Information

• The National Sample Survey Organisation (NSSO) and the Census of India are sources of formal data on unemployment in India.

• The NSSO conducts surveys to collect data on employment and unemployment.

• The Census of India also publishes data on employment and unemployment.

Q67. Answer: (c) North-east

Given:

Town X is west of town Y.

Town Q is north of X.

Town P is east of Q and north-west of Y.

Thus, Town P is north-east of Town X.

Hence, the correct answer is " Option 3".

Q68. Answer: (d) 6

Shortcut Trick

Assume the Mean is 11. Calculate the net deviation of the known numbers from 11.

Deviations: (11 − 11) + (15 − 11) + (13 − 11) + (10 − 11) = 0 + 4 + 2 − 1 = +5.

To maintain the Mean at 11, the deviation of p must be −5.

Value of p = 11 − 5 = 6.

Therefore The correct answer is 6.

Alternate Method

Given: Observations = 11, 15, 13, p, 10 | Arithmetic Mean = 11 | Total count (n) = 5

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

=> 11 = (11 + 15 + 13 + p + 10) ÷ 5

=> 11 × 5 = 49 + p

=> 55 = 49 + p

=> p = 55 − 49

=> p = 6

Therefore The correct answer is 6.

Additional Information

Q69. Answer: (c) 4 ohm

The correct answer is 4ohm.

Key PointsGiven: Known Resistence= 2ohm, let unknown resistance be: x

Formula: R_(series)=R1+R2, R1=2 ohm and R2=x

=> R_(series) = 6 ohm

=> R_(series) = 2+x

=> 6= 2+x

=> x=4

Hence, unknown resistance is 4ohm

Additional Information

• Ohm's Law states that the current flowing through a conductor between two points is directly proportional to the voltage across the two points and inversely proportional to the resistance between them.

• The formula for Ohm's Law is given by: V=IR

• where, V is the voltage across the conductor (measured in volts, V).

• I is the current flowing through the conductor (measured in amperes, A).

• R is the resistance of the conductor (measured in ohms, Ω).

• Series Resistance

• In a series configuration, resistors are connected end-to-end, and the same current flows through each resistor in sequence.

• The total or equivalent resistance of resistors in series is the sum of their individual resistances.

• R_(series)= R1+R2+R3+.....R_n

• Parallel Resistance

• In a parallel configuration, resistors are connected such that each resistor is directly connected to the voltage source.

• This means that the voltage across each resistor in parallel is the same.

• The total or equivalent resistance of resistors in parallel is found by the reciprocal of the sum of the reciprocals of their individual resistances.

• 1/(R_(parallel))=1/R1+1/R2+1/R3+.....1/R_n

Q70. Answer: (b) neither intersects nor touches the x-axis

Shortcut Trick

For any real value of x, the term x2 is always non-negative (x2 ≥ 0).

Multiplying by 9, 9x2 ≥ 0.

Adding 16 to both sides, 9x2 + 16 ≥ 16.

Since the minimum value of y is 16, the graph stays entirely above the x-axis (where y = 0).

Therefore The correct answer is neither intersects nor touches the x-axis.

Alternate Method

Given: Equation of the graph is y = 9x2 + 16.

Formula Used: For a quadratic equation ax2 + bx + c = 0, the Discriminant (D) = b2 − 4ac.

=> To find if the graph touches or intersects the x-axis, we set y = 0.

=> 9x2 + 0x + 16 = 0

=> Here, a = 9, b = 0, and c = 16.

=> D = (0)2 − 4 × 9 × 16

=> D = 0 − 576 = −576

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

=> This means the graph does not have any x-intercepts and thus never meets the x-axis.

Therefore The correct answer is neither intersects nor touches the x-axis.

Additional Information

Nature of Roots and Graph

If D > 0, the graph intersects the x-axis at two distinct points. If D = 0, the graph touches the x-axis at exactly one point (the vertex).

Parabola Orientation

For y = ax2 + bx + c, if a > 0, the parabola opens upwards. If a < 0, it opens downwards.

Vertex of a Parabola

The vertex (minimum or maximum point) of the parabola is located at the coordinates (−b/2a, −D/4a).

Q71. Answer: (b) Second to the left of P

Given:

1) Exactly two boys sit between S and N, to the right of S.

2) P is an immediate Neighbour of M and S.

3) R is second to the right of P and to the immediate right of S.

4) N is an immediate Neighbour of Q and O.

5) O is third to the left of M,

Here, Q is seated second to the left of P.

Hence, the correct answer is " Option 2 ".

Q72. Answer: (d) 2016

The correct answer is 2016

Key Points

• On 4 September 2016, Mother Teresa was canonized as a saint by Pope Francis at a grand ceremony at the Vatican.

• Mother Teresa, a renowned and celebrated nun, who served thousands of diseased and destitute people in Kolkata was canonized by Pope Francis at a grand ceremony in the Vatican.

• The event saw lakhs of pilgrims, including those from India, reaching the venue to witness the ceremony.

• A 12-member delegation led by the Minister of External Affairs Sushma Swaraj and a delegation from West Bengal and New Delhi including Mamata Banerjee and Arvind Kejriwal also became a part of the event.

Additional Information

• Mother Mary Teresa Bojaxhiu, honoured in the Catholic Church as Saint Teresa of Calcutta, was an Albanian-Indian Roman Catholic nun and missionary.

• She was born in Skopje, then part of the Kosovo Vilayet of the Ottoman Empire.

• During her lifetime Mother Teresa became famous as the Catholic nun who dedicated her life to caring for the destitute and dying in the slums of Calcutta - now known as Kolkata.

Q73. Answer: (b) 'She is a Changemaker'

The correct answer is 'She is a Changemaker'

Key Points

• In December 2021, the National Commission for Women (NCW) launched the pan-India capacity-building programme called "She is a Changemaker" to enhance the leadership skills of grassroots women political leaders.

• This initiative aimed to empower women in politics and governance by providing them with the necessary tools and training to strengthen their roles in decision-making.

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• It is to enhance the leadership abilities of women serving in Panchayati Raj Institutions and urban local bodies.

• It is to To provide training on effective governance, policymaking, and understanding legal and constitutional frameworks.

Additional Information

• National Commission for Women:

• It is also one of the significant statutory bodies established by the Government of India.

• It was established in 1992 under the provisions of the National Commission for Women Act, 1990.

• The Central Government took the initiative to establish this Commission by keeping in view the provisions of India's constitution to strengthen the women in the country through addressing plights, suppressions, and other types of violence they use to face.

• National Commission for Women also takes the initiatives for the overall development of the women community in the whole country.

Q74. Answer: (d) Transportation in phloem uses GTP & CTP

The correct answer is Transportation in phloem uses GTP & CTP

Key Points

• The statement "Transportation in phloem uses GTP & CTP" is false.

• Phloem transport uses energy in the form of ATP to move materials like sucrose into the phloem tissue.

• Phloem transport is a process that moves food and other substances throughout a plant.

• The process of phloem transport is driven by osmotic pressure gradients and active transport processes.

Additional Information

• The primary sugar transported in phloem is sucrose, which is a non-reducing sugar.

• Phloem transport is bidirectional, meaning it can transport nutrients in both upward and downward directions.

• The increase in osmotic pressure due to sucrose causes water to move into the phloem tissue.

• The pressure moves the material in the phloem to tissues which have less pressure.

• Functions of plant tissues:

• Plant tissues have different functions depending upon their structure and location

• Help provide mechanical strength to organs.

• They help in providing elasticity and flexibility to the organs.

• They help the tissues to bend easily in various parts of a plant like- leaf, stem, and branches without damaging the plant

• The xylem and phloem tissues help in the transportation of material throughout the plants

• They divide to produce new cells and help in the growth of the plants.

• They help in various cellular metabolisms like photosynthesis, regeneration, respiration, etc.

Q75. Answer: (d) 25%

Shortcut Trick

Gain is 1/5 of the Selling Price (SP).

Let SP = 5 units, then Gain = 1 unit.

Cost Price (CP) = SP − Gain = 5 − 1 = 4 units.

Gain% = (Gain ÷ CP) × 100 = (1 ÷ 4) × 100 = 25%.

Therefore The correct answer is 25%.

Alternate Method

Given: Selling Price (SP) = Rs. 15,000 | Gain = 1/5 of SP.

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

=> Gain = 1/5 × 15,000 = Rs. 3,000.

=> Cost Price (CP) = SP − Gain = 15,000 − 3,000 = Rs. 12,000.

=> Gain% = (3,000 ÷ 12,000) × 100.

=> Gain% = 1/4 × 100 = 25%.

Therefore The correct answer is 25%.

Additional Information

Profit and Loss on SP vs CP

Generally, profit percentage is calculated on Cost Price unless specified otherwise. If profit is given as a fraction of SP (1/n), the profit on CP is 1/(n−1).

Conversion Formula

Profit% on CP = [Profit% on SP ÷ (100 − Profit% on SP)] × 100.

Q76. Answer: (a) 12 : 1

Shortcut Trick

HCF of (5, 15, 20) → Smallest number (5) divides all, so HCF = 5.

LCM of (5, 15, 20) → Largest number is 20. Multiples of 20: 20, 40, 60. 60 is divisible by 5 and 15, so LCM = 60.

Required Ratio = 60 : 5 = 12 : 1.

Therefore The correct answer is 12 : 1.

Alternate Method

Given: Numbers are 5, 15, and 20.

Prime Factorization:

=> $5 = 5^1$

=> $15 = 3^1 \times 5^1$

=> $20 = 2^2 \times 5^1$

Calculations:

=> HCF = Product of lowest powers of common factors = $5^1 = 5$.

=> LCM = Product of highest powers of all prime factors = $2^2 \times 3^1 \times 5^1$

=> LCM = $4 \times 3 \times 5 = 60$.

=> Required Ratio = LCM : HCF

=> Ratio = 60 : 5

=> Ratio = 12 : 1

Therefore The correct answer is 12 : 1.

Additional Information

Product Rule

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

LCM and HCF of Fractions

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

Co-prime Numbers

If two numbers are co-prime, their HCF is 1 and their LCM is their product.

Q77. Answer: (a) Rs. 25,625

Shortcut Trick

Multiplying factor for 25% interest = (1 + 25/100) = 1.25

Balance after 1^(st) year = (20,000 × 1.25) − 2,500 = 25,000 − 2,500 = Rs. 22,500

Balance after 2^(nd) year = (22,500 × 1.25) − 2,500 = 28,125 − 2,500 = Rs. 25,625

Therefore The correct answer is Rs. 25,625.

Alternate Method

Given: Principal (P) = Rs. 20,000 | Rate (R) = 25% p.a. | Instalment (x) = Rs. 2,500

At the end of Year 1:

=> Interest = 20,000 × (25 / 100) = Rs. 5,000

=> Total Amount = 20,000 + 5,000 = Rs. 25,000

=> Balance after 1^(st) instalment = 25,000 − 2,500 = Rs. 22,500

At the end of Year 2:

=> Interest = 22,500 × (25 / 100) = Rs. 5,625

=> Total Amount = 22,500 + 5,625 = Rs. 28,125

=> Balance after 2^(nd) instalment = 28,125 − 2,500 = Rs. 25,625

Therefore The correct answer is Rs. 25,625.

Additional Information

Compound Interest Formula

The amount A after n years is given by $A = P(1 + R/100)^n$, where interest is added back to the principal.

Effective Rate with Part Payment

In cases of part payment, calculate the interest on the current balance first, then subtract the payment to find the new principal for the next period.

Simple vs Compound Interest

In Compound Interest, the debt grows faster because interest is charged on the accumulated interest of previous years.

Q78. Answer: (b) 20,000

Shortcut Trick

Let the initial population be 100%.

Successive reduction: 100% × 4/5 (after 20% loss) × 19/20 (after 5% loss) = 15,200.

Total reduction factor = 0.8 × 0.95 = 0.76.

Initial Population = 15,200 ÷ 0.76 = 20,000.

Therefore The correct answer is 20,000.

Alternate Method

Given:

Reduction 1 (War) = 20%

Reduction 2 (Epidemic) = 5% of remaining

Present population = 15,200

Let the population before the war be x.

=> Population after war = x − (20% of x) = 0.8x

=> Population after epidemic = 0.8x − (5% of 0.8x)

=> 0.8x × (1 − 0.05) = 15,200

=> 0.8x × 0.95 = 15,200

=> 0.76x = 15,200

=> x = 15,200 ÷ 0.76

=> x = 20,000

Therefore The correct answer is 20,000.

Additional Information

Successive Percentage Change

When a value is changed by a% and then by b%, the net effective change is (a + b + ab/100)%.

Base Change Property

If the population decreases by r%, the new population is P × (1 − r/100). For successive decreases, multiply the factors: P × (1 − r1/100) × (1 − r2/100).

Q79. Answer: (c) DNA

The correct answer is DNA

Key Points

• Deoxyribonucleic acid (DNA) is the genetic material that is inherited from one generation to another.

• It is a complex nucleic acid of high molecular weight consisting of many nucleotides.

• Nucleotides are made of a deoxyribose sugar phosphoric acid and one of four bases.

• Among DNA bases present in DNA two are purines and two pyrimidines

• Adenine always attaches to thymine and guanine with cytosine

• The nucleotides are arranged as two long chains that twist around each other to form a double helix joined by hydrogen bonds between the complementary base pairs A-T and C-G.

• Additional Information

• RNA

• It is a polymer of nucleotides that is made up of a ribose sugar, a phosphate, and bases such as adenine (A), guanine (G), cytosine (C), and uracil (U).

• It has various biological roles in coding, decoding, regulation, and expression of genes.

• RNA is a nucleic acid messenger between DNA and ribosomes.

• Thymine (T) in DNA is replaced by uracil (U) in RNA.

• Proteins

• Proteins are large, complex molecules that are essential for the structure, function, and regulation of the body’s tissues and organs.

• Proteins are made up of hundreds of smaller units called amino acids that are attached to one another by peptide bonds, forming a long chain.

• Enzymes

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• Enzymes are proteins made from amino acids.
• It is made up of hundreds and thousands of amino acids stringed together in a very specific and unique order.
• Any chemical reaction inside a cell or any work that goes on inside a cell is the handiwork of enzymes inside the cell.
• The word enzyme was coined in 1878 by German Scientist Wilhelm Kuhne.
• Enzymes act as biological catalysts (biocatalysts).
• Catalysts accelerate chemical reactions.
• The molecules upon which enzymes may act are called substrates, and the enzyme converts the substrates into different molecules known as products.

Q80. Answer: (b) Same osmotic pressure as blood and is devoid of nitrogenous wastes

The correct answer is Same osmotic pressure as blood is devoid of nitrogenous wastes

Key Points

• Hemodialysis uses a tank of dialysing fluid with the same osmotic pressure as blood, but without nitrogenous wastes.
• Hemodialysis is a medical procedure that uses an artificial kidney to remove waste products from a patient's blood.
• The artificial kidney contains tubes with semi-permeable linings that are suspended in a tank of dialysing fluid.
• The patient's blood is passed through the tubes.
• Waste products pass from the blood into the dialysing fluid through diffusion.
• The purified blood is then pumped back into the patient

Additional Information

• Hemodialysis is used when the kidneys are unable to filter waste from the blood.
• This can happen due to chronic or acute diseases, drug use, or exposure to hazardous pollution.
• It's a common treatment for advanced kidney failure.
• Hemodialysis can help you feel better and live longer.
• It can help control blood pressure and balance minerals like potassium, sodium, and calcium.

Q81. Answer: (a) 52.6

Shortcut Trick

Let the assumed mean (A) be 50.

Calculate deviations (d = Marks − 50) and their products with frequency (f × d):

For 50: 3 × 0 = 0 | For 28: 4 × (−22) = −88 | For 85: 6 × 35 = 210 | For 40: 7 × (−10) = −70

Sum of deviations (Σfd) = 0 − 88 + 210 − 70 = 52

Mean = A + (Σfd ÷ Σf) = 50 + (52 ÷ 20) = 50 + 2.6 = 52.6

Therefore The correct answer is 52.6.

Alternate Method

Given:

The frequency distribution of marks is:

Marks (x1) = 50, Frequency (f1) = 3

Marks (x2) = 28, Frequency (f2) = 4

Marks (x3) = 85, Frequency (f3) = 6

Marks (x4) = 40, Frequency (f4) = 7

Formula Used:

The arithmetic mean (x) of a discrete frequency distribution is given by:

$x = \Sigma f_i x_i \div \Sigma f_i$

Calculations:

Calculate the sum of the products of marks and their respective frequencies (Σfx):

=> f1x1 = 3 × 50 = 150

=> f2x2 = 4 × 28 = 112

=> f3x3 = 6 × 85 = 510

=> f4x4 = 7 × 40 = 280

=> Σfx = 150 + 112 + 510 + 280 = 1052

Calculate the sum of all frequencies (Σf):

=> Σf = 3 + 4 + 6 + 7 = 20

Now, calculate the arithmetic mean:

=> Mean = Σfx ÷ Σf

=> Mean = 1052 ÷ 20

=> Mean = 52.6

Thus, the arithmetic mean of the given frequency distribution is 52.6.

Explanation of Options:

=> Option (1) 52.6 is the correct calculated weighted mean.

=> Option (2) 40.95 is incorrect as it is significantly lower than the actual weighted average.

=> Option (3) 50.5 is incorrect as it represents a simple average of the marks without considering their frequencies.

=> Option (4) 56.2 is incorrect due to calculation error.

Therefore The correct answer is 52.6.

Additional Information

Arithmetic Mean for Grouped Data

For grouped frequency distributions, the mean is calculated as $x = \Sigma f_i x_i \div \Sigma f_i$, where x_i represents the class mark (midpoint) of each class interval.

Assumed Mean Method

A shortcut method to find the mean of large numbers: Mean = $A + (\Sigma f_i d_i \div \Sigma f_i)$, where A is the assumed mean and $d_i = x_i - A$.

Step-Deviation Method

Used when class intervals are of equal size: Mean = $A + h \times (\Sigma f_i u_i \div \Sigma f_i)$, where $u_i = (x_i - A) \div h$ and h is the class width.

Q82. Answer: (a) 2.67 cm

Shortcut Trick

According to the Angle Bisector Theorem, the angle bisector of a triangle divides the opposite side in the ratio of the other two sides.

Ratio of BD : DC = AB : AC = 4 : 5

Total ratio parts = 4 + 5 = 9 parts, which corresponds to the total length of BC = 6 cm.

Length of BD = (4 ÷ 9) × 6 = 24 ÷ 9 ≈ 2.67 cm.

Therefore The correct answer is 2.67 cm.

Alternate Method

Given:

Side AB = 4 cm

Side AC = 5 cm

Side BC = 6 cm

AD is the angle bisector of angle A intersecting BC at D.

Formula Used:

Angle Bisector Theorem: In any triangle, the internal bisector of an angle divides the opposite side internally in the ratio of the sides containing the angle.

BD ÷ DC = AB ÷ AC

Calculations:

Let the length of BD be x cm.

=> DC = BC − BD = 6 − x cm

Applying the Angle Bisector Theorem:

=> x ÷ (6 − x) = 4 ÷ 5

=> 5 × x = 4 × (6 − x)

=> 5x = 24 − 4x

=> 5x + 4x = 24

=> 9x = 24

=> x = 24 ÷ 9

=> x = 8 ÷ 3

=> x ≈ 2.67 cm

Option Analysis:

Option (1) 2.67 cm: This is the correct value of BD calculated using the Angle Bisector Theorem, where BD = 8 ÷ 3 ≈ 2.67 cm.

Option (2) 2.25 cm: This is incorrect because it represents the horizontal distance of vertex A from B, not the length of BD.

Option (3) 1.50 cm: This is incorrect because it does not satisfy the ratio BD : DC = 4 : 5 (if BD = 1.5 cm, then DC = 4.5 cm, giving a ratio of 1 : 3 instead of 4 : 5).

Option (4) 3.00 cm: This is incorrect because it would mean BD = DC = 3 cm, which only occurs if the triangle is isosceles with AB = AC, but here AB ≠ AC.

Therefore The correct answer is 2.67 cm.

Additional Information

Angle Bisector Theorem (External)

If the external bisector of angle A intersects the extension of BC at D, then BD ÷ CD = AB ÷ AC.

Length of Angle Bisector

The length of the internal angle bisector AD can be calculated using the formula: $AD^2 = AB \times AC - BD \times DC$.

Incenter Coordinates

The angle bisectors of a triangle intersect at the incenter (I), which divides the bisector AD in the ratio: AI ÷ ID = (AB + AC) ÷ BC.

Q83. Answer: (a) pre-monsoon showers which are common in the states of Karnataka and Kerala

The correct answer is pre-monsoon showers which are common in the states of Karnataka and Kerala

Key Points

• Mango showers are pre-monsoon showers that are common in the states of Kerala, Karnataka, and Tamil Nadu.
• They are also known as summer rains.
• Mango showers are pre-monsoon showers that occur at the end of summer.
• They are common in the coastal areas of Karnataka and Kerala.
• They are usually difficult to predict by the meteorological department.
• They can range from light drizzles to violent thunderstorms.
• They help in the early ripening of mangoes.

Additional Information

• Blossom showers -
• This is also known as a cherry blossom or espresso shower.
• This occurs nearby the wind areas.
• This period in India is referred to as the early monsoon.
• Tea shower -
• Pre-monsoon rain is required for tea plantations.
• This is known as the 'Tea shower' in Assam.
• In West Bengal, it is called Kalbaishakh.

Q84. Answer: (d) 243

The logic followed here is:

=> (First number - 3)^(first number - 1) = Second number.

For, 7 : 4096

=> (7 - 3)^(7 - 1) = 4096

=> (4)^6 = 4096

=> 4096 = 4096

For, 4 : 1

=> (4 - 3)^4^(- 1)=1

=> $(1)^3$= 1

=> 1 = 1

Similarly,

For, 6 : ?

=> (6 - 3)^(6 - 1) = ?

=> (3)^5= ?

=> 243

Hence, the correct answer is "Option 4".

Q85. Answer: (a) CH3COONa and H2O

The correct answer is CH3COONa and H2O.

Key Points

• When sodium hydroxide (NaOH) reacts with acetic acid (CH3COOH), the products formed are sodium acetate (CH3COONa) and water (H2O).

• Therefore, 'X' is sodium acetate and 'Y' is water.

• The balanced chemical equation is: NaOH + CH3OOH → CH3COOONa + H2O.

• The reaction is a neutralization reaction, where an acid (acetic acid) reacts with a base (sodium hydroxide) to form a salt (sodium acetate, CH3COONa) and water (H2O).

• This is a classic example of an acid-base reaction resulting in the formation of a salt and water, adhering to the general reaction pattern: Acid+ Base → Salt + Water

Additional Information

• Decomposition Reaction: In this reaction, a single compound breaks down into two or more simpler substances. The general form is AB → A + B.

• Single Displacement Reaction: Also known as a substitution reaction, it involves an element reacting with a compound where one element displaces another in the compound. The general form is A + BC → AC + B.

• Double Displacement Reaction: This reaction involves the exchange of ions between two compounds to form two different products. The general form is AB + CD → AD + CB.

• Combustion Reaction: A combustion reaction involves a substance reacting quickly with oxygen to produce heat and light, typically producing carbon dioxide and water when a hydrocarbon is burned in air. The general form is C_xH_y + O2 → CO2 + H2O.

• Redox Reaction: These are reactions where the oxidation states of atoms are changed due to the transfer of electrons between them. Redox reactions encompass many types of chemical reactions, including simple ones like the rusting of iron or the metabolism of food in our bodies.

• Neutralization Reaction: This type involves an acid reacting with a base, often producing a salt and water as products, such as the neutralization reactions between hydrochloric acid and sodium hydroxide. The general form is HA + BOH → BA + H2O

Q86. Answer: (b) NaOH

The correct answer is NaOH

Key Points

• Among the options provided, NaOH (Sodium Hydroxide) does not contain a covalent bond.

• A covalent bond is formed when two atoms share their unpaired electrons

• Covalent bonding is more common than ionic bonding in organic chemistry.

• Nonmetals often form covalent bonds with other nonmetals.

Additional Information

• CH4 (Methane) contains covalent bonds between carbon and hydrogen.

• NH3 (Ammonia) contains covalent bonds between nitrogen and hydrogen.

• H2 (Hydrogen gas) consists of a molecule with covalent bonds between two hydrogen atoms.

Q87. Answer: (c) virtual and erect

The correct answer is virtual and erect

Key Points

• The image formed by a convex mirror is always virtual and erect.

• The image is also diminished, meaning it appears smaller than the actual object.

• The image is diminished, meaning it appears smaller than the actual object.

• The amount the image is diminished depends on the object's position in front of the mirror.

Additional Information Convex mirror

• If the outer surface of the spherical mirror is the reflecting surface then it is called a convex mirror.

• It is also called the diverging mirror.

• The nature of the image formed by a convex mirror does not depend on the distance of the object from the mirror.

• The images are always virtual, smaller than the object, and situated behind the mirror.

• The convex mirror always forms a virtual image that lies between the pole and the focus of the mirror.

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Q88. Answer: (b) India

The correct answer is India

Key Points

• NAVIC is an independent Indian Satellite based positioning system.

• It is an acronym for NAVigation with Indian Constellation.

• It is the operational name of the Indian Regional Navigation Satellite System (IRNSS).

• It covers India and a region extending 1,500 km around it, with plans for further extension.

Additional Information

• The system is intended to provide an absolute position accuracy of better than 10 meters (33 ft) throughout the Indian landmass and better than 20 meters (66 ft) in the region extending approximately 1,500 km (930 mi) around India.

• The system currently consists of a constellation of seven satellites, with two additional satellites on the ground as stand-by.

• NAVIC will provide two levels of service, the "standard positioning service", which will be open for civilian use, and a "restricted service" (an encrypted one) for authorized users (including the military).

Q89. Answer: (d) Dussehra

The correct answer is Dussehra.

Key Points:

• The tenth day after Sharad Navratri is celebrated as Dussehra or Vijayadashami.

• Dussehra is the festival that marks the triumph of Lord Rama over the demon king Ravana.

• It is a major Hindu festival that is celebrated in the month of Ashwin.

• Dussehra is a celebration of good over evil

• Dussehra is one of the major Hindu festivals that marks the end of Navratri.

• The festival is celebrated as the victory of Lord Rama over Ravana

Additional Information

• Holi:

• Holi marks the arrival of spring after a long winter and is symbolic of the triumph of good over evil

• It is the festival of colours where people play with water and powder colours.

• It falls in the Hindu calendar month of Phalgun on the full-moon day, which is in March.

• It is the second biggest Hindu festival after Diwali.

• Ram Navami:

• Ram Navami is a Hindu festival that celebrates the birth of Lord Rama, one of the most revered deities in Hinduism.

• It falls on the ninth day of Shukla Paksha in the Hindu month of Chaitra, which usually falls in March or April according to the Gregorian calendar.

• The festival is celebrated with great enthusiasm and devotion by Hindus all over the world, with special prayers, fasting, and offerings being made to Lord Rama and his consort Sita.

• The celebrations include processions, singing of devotional songs, and recitation of the Ramayana, the epic story of Lord Rama's life and deeds.

• Rakshabandhan

• Raksha Bandhan or Rakhi Purnima is celebrated on the full moon day, or Purnima tithi, according to the Hindu calendar.

• It is observed during the Shravana month.

• Hindus celebrate Raksha Bandhan every year as a well-known and customary ritual or celebration.

• On this day, sisters of all ages wrap their brothers' wrists with a charm or amulet known as the Rakhi.

• They give them a present in exchange for protecting them figuratively, share some of the burdens of their potential care with the brothers, and symbolically protect them.

Q90. Answer: (c) 8

Shortcut Trick

Numbers in descending order: 875, 652, 423, 246, 168.

Second greatest number is 652 → its third digit is 2.

Smallest number is 168 → its second digit is 6.

Resultant = 2 + 6 = 8.

Therefore The correct answer is 8.

Alternate Method

Given Numbers: 423, 875, 652, 246, 168

Step 1: Identify the second greatest number.

=> Greatest number = 875

=> Second greatest number = 652

=> Third digit of 652 = 2

Step 2: Identify the smallest number.

=> Smallest number = 168

=> Second digit of 168 = 6

Step 3: Calculate the resultant by adding these digits.

=> Resultant = 2 + 6

=> Resultant = 8

Therefore The correct answer is 8.

Additional Information

Digit Positioning

In a three-digit number XYZ, X is the first digit (hundreds place), Y is the second digit (tens place), and Z is the third digit (units place).

Number Ranking

To find the greatest or smallest number, always compare from the leftmost digit (hundreds place) first. If they are equal, move to the next digit to the right.

Q91. Answer: (a) KOH : OSL

The logic followed here is:

For, ADG : EHK

For, TJF : XNJ

Similarly,

For, KOH : OSL

Hence, the correct answer is "Option 1".

Q92. Answer: (c) √2

Shortcut TrickRewrite sin2 x + 3 cos2 x = 2 as (sin2 x + cos2 x) + 2 cos2 x = 2.Since sin2 x + cos2 x = 1, we get 1 + 2 cos2 x = 2 → 2 cos2 x = 1.cos2 x = 1/2 => cos x = 1/√2, which means x = 45°.Then, cosec 45° = √2.Therefore The correct answer is √2.Alternate MethodGiven: sin2 x + 3 cos2 x = 2 and 0° < x < 90°.Formula Used: sin2 x + cos2 x = 1=> sin2 x + 3(1 − sin2 x) = 2=> sin2 x + 3 − 3 sin2 x = 2=> 3 − 2 sin2 x = 2=> 2 sin2 x = 1=> sin2 x = 1/2=> sin x = 1/√2=> cosec x = 1 / sin x = √2Therefore The correct answer is √2.Additional InformationTrigonometric IdentitiesFundamental identities include sin2θ + cos2θ = 1, 1 + tan2θ = sec2θ, and 1 + cot2θ = cosec2θ.Reciprocal RelationsReciprocal pairs are: sinθ = 1/cosecθ, cosθ = 1/secθ, and tanθ = 1/cotθ.Standard Values at 45°At x = 45°, sin x = 1/√2, cos x = 1/√2, and tan x = 1.

Q93. Answer: (a) 22°

Shortcut Trick

Since line a || line b, the marked angles are corresponding angles.

=> 6x − 36 = 96

=> 6x = 132

=> x = 22

Therefore The correct answer is 22.

Alternate Method

Given:

Line a || Line b

One angle = 96°

Other angle = (6x − 36)°

Formula Used:

Corresponding angles formed by a transversal on parallel lines are equal.

Calculations:

=> Corresponding angles are equal.

=> 6x − 36 = 96

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=> 6x = 96 + 36

=> 6x = 132

=> x = 132 ÷ 6 = 22

Therefore The correct answer is 22.

Additional Information

Corresponding Angles

If two parallel lines are cut by a transversal, corresponding angles are always equal.

Alternate Interior Angles

Alternate interior angles are equal when the two lines are parallel.

Co-interior Angles

Interior angles on the same side of the transversal are supplementary and add up to 180°.

Q94. Answer: (a) West

Given:

Puneet walks 4 m towards the west.

He turns right and walks 7 m.

He turns left and walks 4 m.

He again turns left and walks 7 m.

He turns right and walks 3 m.

Thus, he is facing west direction now.

Hence, the correct answer is " Option 1 ".

Q95. Answer: (c) The plant height is governed by T only

The correct answer is The plant height is governed by T or t

Key Points

• A cross between a tall plant (TT) and short plant (tt) resulted in all tall offspring because the plant height is governed by T only

• This is an example of a monohybrid cross

• In Mendelian genetics, the allele (TT) represents tallness and the allele (tt) represents shortness.

• When two traits of a character are crossed, the (F_(1)) plants only show the dominant trait.

Additional Information

• 'Pure' plants refer to the homozygous condition in plants and 'hybrid' refers to the heterozygous plants.

• Homozygous - It is the condition in which the pair of alleles determining a phenotype is identical, either both dominant (TT) or both recessive (tt).

• Heterozygous - It is the condition where 2 different types of alleles are present, one dominant and one recessive (Tt).

• When a pure tall plant (TT) is crossed with a pure short plant (tt), the F1 generation produces heterozygous tall (Tt) plants.

• Upon selfing the F1 generation, that is, crossing two heterozygous tall plants, the following numbers of the F2 generation are obtained phenotypically:

• Three tall plants and one short plant

• Whereas, genotypically, the following ratio is obtained:

• One pure tall plant, two heterozygous tall plants, and one pure short plant.

• Therefore, considering the genotype, the ratio of pure tall plants to pure short plants in the F2 generation is 1:1

Q96. Answer: (a) an annual statement of the estimated receipts and expenditure of the government over the fiscal year

The correct answer is an annual statement of the estimated receipts and expenditure of the government over the fiscal year

Key Points

• A government budget is an annual statement that estimates a government's income and expenses for the fiscal year.

• It's also known as the Annual Financial Statement or Budget Statement.

• A budget outlines the government's intended spending and revenue collection.

• It's usually prepared annually, keeping in mind the financial year.

Additional Information

• A budget reveals the government's fiscal policy, which focuses on the economy's stability and growth.

• A budget helps the government focus on public sector companies by introducing policies to help them grow.

• In India, the financial year runs from April 1 to March 31.

• The Constitution of India requires that the government lay out its estimated receipts and expenditures for each financial year before Parliament.

Q97. Answer: (a) 6 7/9

Shortcut Trick

Total Distance = 220 + 250 + 140 = 610 km

Total Time = (220 ÷ 11) + (250 ÷ 5) + (140 ÷ 7) = 20 + 50 + 20 = 90 hours

Average Speed = Total Distance ÷ Total Time = 610 ÷ 90 = 61/9 km/h

Simplified value = 6 7/9 km/h

Therefore The correct answer is 6 7/9 km/h.

Alternate Method

Given:

Distances (d1, d2, d3) = 220 km, 250 km, 140 km

Speeds (s1, s2, s3) = 11 km/h, 5 km/h, 7 km/h

Formula Used:

Average Speed = (d1 + d2 + d3) ÷ (t1 + t2 + t3)

Where Time (t) = Distance (d) ÷ Speed (s)

Calculations:

=> t1 = 220 ÷ 11 = 20 h

=> t2 = 250 ÷ 5 = 50 h

=> t3 = 140 ÷ 7 = 20 h

=> Total Distance = 220 + 250 + 140 = 610 km

=> Total Time = 20 + 50 + 20 = 90 h

=> Average Speed = 610 ÷ 90 = 61/9

=> Average Speed = 6 7/9 km/h

Therefore The correct answer is 6 7/9 km/h.

Additional Information

Average Speed for Same Distance

If a person travels two equal distances at speeds x and y, the Average Speed = 2xy/(x + y).

Relative Speed

When two objects move in the Same Direction, relative speed = s1 − s2. In Opposite Directions, relative speed = s1 + s2.

Unit Conversion

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

Q98. Answer: (c) (33, 38, 568)

The logic followed here is:

Logic: (1st Number + 2nd Number) × 8 = 3rd number.

Given,

(22, 49, 568)

=> (22 + 49) × 8

=> 71 × 8 = 568.

And, (25, 45, 560)

=> (25 + 45) × 8

=> 70 × 8 = 560.

Now, checking the options:

Option 1) (30, 15, 225)

=> (30 + 15) × 8

=> 45 × 8 = 360 ≠ 225.

Option 2) (15, 33, 240)

=> (15 + 33) × 8

=> 48 × 8 = 384 ≠ 240.

Option 3) (33, 38, 568)

=> (33 + 38) × 8

=> 71 × 8 = 568 = 568.

Option 4) (18, 27, 225)

=> (18 + 27) × 8

=> 45 × 8 = 360 ≠ 225

Hence, the correct option is "Option 3".

Q99. Answer: (a) 12

Shortcut Trick

Applying the Man-Days concept: M1D1 = M2D2

X × 15 = (X − 3) × 20

3X = 4(X − 3) => 3X = 4X − 12

X = 12

Therefore The correct answer is 12.

Alternate Method

Given: Initial people = X, Initial days = 15 days, Absent people = 3, Actual days taken = 20 days.

Formula Used: Total Work = Number of People × Number of Days

=> Total Work = X × 15

=> Total Work = (X − 3) × 20

=> 15X = 20X − 60

=> 20X − 15X = 60

=> 5X = 60

=> X = 60 ÷ 5

=> X = 12

Therefore The correct answer is 12.

Additional Information

MDH Formula

For work involving men, days, and hours, use (M1×D1×H1)/W1 = (M2×D2×H2)/W2.

Inverse Proportion

The number of people is inversely proportional to the time taken. If people decrease, time increases in the same ratio.

Efficiency and Work

Total Work = Efficiency × Time. In this problem, the efficiency of each person is assumed to be constant.

Q100. Answer: (d) 2

Given:

√(2 + √(2 + √(2 + … … … .)))

Calculation:

Let √(2 + √(2 + … … … .)) be y.

=> y = √(2 + y)

Squaring both sides

=> $y^2 = 2 + y$

=> $y^2 – y – 2 = 0$

=> (y – 2) (y + 1) = 0

=> y = 2 or y = -1

Because y is a square root it can’t be negative.

=> y = 2

Thus, √(2 + √(2 + √(2 + … … … .))) = 2

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