RRB Group D Previous Year Paper (Held on: 24 Aug 2022 Shift 3)

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

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CBT

Q1. Six girls named P, Q, R, S, T and U are sitting in a straight line. All are facing the north direction. U sits third to the left of R. S sits third to the right of Q. U sits second to the left of Q. T is not the immediate neighbour of U. What is P's position in the line?

(a) Third from the extreme right end
(b) Second from the extreme left end
(c) Third from the extreme left end
(d) At the extreme left end

Q2. The policy norms for Mission Vatsalya scheme implemented by the Ministry of Women and Child Development have been applicable from the 1^(st) of which month in 2022:

(a) March
(b) August
(c) January
(d) April

Q3. Refer to the following letter, number and symbol series and answer the question.

(Left) 4 T 6 $ 2 A D & C E 2 4 + & 7 6 U 5 H U K 8 E W @ E A & P (Right)

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

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

Q4. Which of the following compounds possesses the highest boiling point?

(a) Acetic acid
(b) Ethanol
(c) Chloroform
(d) Methane

Q5. Cork is impermeable to water and gases because of _____ found within its cells.

(a) cutin
(b) cellulose
(c) lignin
(d) suberin

Q6. Refer to the following number series and answer the question.

2 5 2 6 5 2 2 6 3 8 9 5 6 3 6 2 2 5 5 3

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

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

Q7. 8118 is divisible by:

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

Q8. What is the measure of each exterior angle of a regular hexagon?

(a) 120°
(b) 45°
(c) 30°
(d) 60°

Q9. 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 condition is your answer.

Number/Symbol	^	#	5	7	@	%		2	!	?	4	8	$	3
Code	L	F	B	J	D	H	E	X	V	Z	K	U	R	P

Conditions:

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

(ii) If the first element is an odd number and last element is a symbol, then the first and last elements are to be coded as Ø and ¥, respectively.

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

How will '7 # ^ 2 !' be coded?

(a) J F L X ¥
(b) J B F V Z
(c) Ø F L X ¥
(d) Ø F L X V

Q10. Find the least six-digit number that is exactly divisible by 8, 10, 12 and 16.

(a) 100040
(b) 100020
(c) 100060
(d) 100080

Q11. 5 ml of a solution of NaOH is found to be completely neutralised by 5 ml of a given solution of HCl. If we take 10 ml of the same solution of NaOH, the amount of HCl solution required to neutralise it will be:

(a) 2.5 ml
(b) 15 ml
(c) 10 ml
(d) 5 ml

Q12. In which year was the first Economic Survey presented as part of the Union Budget?

(a) 1960 - 61
(b) 1953 - 54
(c) 1947 - 48
(d) 1950 - 51

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Q13. Find the total surface area of a cylinder whose radius of base is 7 cm and height is 15 cm.

(a) 830π cm2
(b) 380π cm2
(c) 803π cm2
(d) 308π cm2

Q14. What is the basic event in reproduction?

(a) Making of proteins
(b) Replication of RNA
(c) Cell division
(d) Replication of DNA

Q15. Which of the following years was a leap year?

(a) 2006
(b) 2002
(c) 2018
(d) 2012

Q16. A statement is given followed by two assumptions numbered I and II. You have to assume everything in the statement to be true and decide which of the given assumptions is/are implicit in the statement.

Statement:

Many people could not reach their work places due to the strike by transport workers, which has brought bus services to a complete halt.

Assumptions:

I. Citizens should be using the metro rail services more.

II. Many people are dependent on bus services to travel to their work place.

(a) Neither assumption I nor II is implicit
(b) Only assumption II is implicit
(c) Only assumption I is implicit
(d) Both assumptions I and II are implicit

Q17. In December 2021, who among the following won the Woman of the Year Award by World Athletics for grooming talent and encouraging young girls in India to take up sports and fight for gender equality?

(a) Shiny Kurisingal Wilson
(b) Anju Bobby George
(c) PT Usha
(d) PU Chitra

Q18. Which cultural festival of India is a ten-day festival of classical dance, folk art and light music, and is held every year between February and March at Shilpgram?

(a) Nishagandhi Festival
(b) Hampi Dance Utsav
(c) Taj Mahotsav
(d) Natyanjali Utsav

Q19. Which of the following is NOT a quadrilateral?

(a) Rhombus
(b) Parallelogram
(c) Circle
(d) Trapezium

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Q20. 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 condition is your answer.

Number/Symbol	**8**	**=**	**4**	**7**	**@**	**%**		**2**	**!**	**?**	**5**	**3**	**<**	**9**
Code	Z	F	T	J	D	H	E	X	V	W	K	U	P	A

Conditions:

(i) If the first element is a symbol and the last, a number, the codes for these two 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 Ø.

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

How will '3 = < 2 @ 8' be coded?

(a) Ø P F X D Ø
(b) Ø F E D X Ø
(c) Ø F P X D Ø
(d) Ø F E X D Ø

Q21. If one root of the equation $(a + 3)x^2 – 13ax + 7 - a = 0$ is the reciprocal of the other, then the value of a is:

(a) -2
(b) -3
(c) 2
(d) 3

Q22. The 'Archaeological Survey of India' is headquartered in which of the following cities?

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

Q23. Which ministry has launched the world's first multicentre phase III clinical trial to assess Ayurveda's efficacy in Rheumatoid Arthritis treatment?

(a) Ministry of Ayush
(b) Ministry of Health and Family Welfare
(c) Ministry of Science and Technology
(d) Ministry of Chemicals and Fertilizers

Q24. How many Prime Ministers of India have been elected upto June 2022, who were also Chief Ministers of their respective states?

(a) 9
(b) 6
(c) 8
(d) 10

Q25. Two pipes, A and B, can fill a tank of 1000 litres in 5 hours and 6 hours, respectively. If they are opened together, how many hours will they take to fill an empty tank of 1800 litres?

(a) 54/11
(b) 45/11
(c) 52/11
(d) 25/11

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Q26. Which of the following is/are NOT true for ionic compounds?

i. Ionic compounds have low melting and boiling points.

ii. Ionic compounds are brittle and break into pieces when pressure is applied.

iii. Ionic compounds are solids and are somewhat hard because of the strong force of attraction between the positive and negative ions.

iv. Ionic compounds conduct electricity in the molten state.

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

Q27. A current of 5 A flows through a conductor having resistance 2 Ω. The potential difference (in volt) across the ends of the conductor is:

(a) 7
(b) 10
(c) 2.5
(d) 3

Q28. Which of the following is NOT true about the demand curve?

(a) It is the plots of quantities demanded at various time.
(b) It reflects the law of demand.
(c) It is the plots of quantities demanded at various price.
(d) It is negatively sloped.

Q29. In this question, a statement is followed by two conclusions. Which of the two conclusions is/are true with respect to the statement?

Statement: $F = E \geq D = A > Z < S = O$

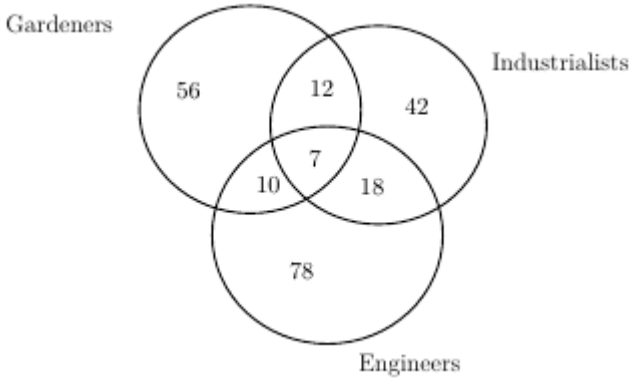
Conclusions:

I. $F \geq D$

II. $D < O$

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

Q30. Study the given diagram carefully and answer the following question. The numbers in different sections indicate the number of persons with different professions.



How many people are Gardeners but NOT Engineers?

(a) 56
(b) 68
(c) 75
(d) 80

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Q31. This question is based on the five, three-digit numbers given below:

(Left) 448 455 275 563 215 (Right)

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

(a) 5
(b) 4
(c) 3
(d) 6

Q32. On which river is India's smallest river island Umananda situated?

(a) Brahmaputra River
(b) Saraswati River
(c) Ganga River
(d) Yamuna River

Q33. The number of solutions to the pair of linear equations $5x – 3y = 7$ and $7x + 4y = 18$ is:

(a) three
(b) infinite
(c) one
(d) none

Q34. Who became the youngest ever Indian to win a BWF Super 100 tournament, in 2022?

(a) Malvika Bansod
(b) Mugdha Agrey
(c) Unnati Hooda
(d) Ashmita Chaliha

Q35. In which year did the Indian government conduct its first nuclear test in the deserts of Pokhran?

(a) 1974
(b) 1968
(c) 1981
(d) 1962

Q36. Three statements are followed by three conclusions numbered I, II and III. You have to consider these statements to be true, even if they seem to be at variance with commonly known facts, and decide which of the given conclusions logically follow/s from the given statements.

Statements:

Some gates are hotels.

Some shelters are gates.

Conclusions:

(I) Some shelters are hotels

(II) All hotels are gates

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

Q37. Janhvi and Pranitha are standing at the extreme ends of a row in which all the students are facing the north. Only 26 students are standing between Janhvi and Ravi. Only 14 students are standing between Ravi and Pranitha. Total how many students are standing in the line?

(a) 44
(b) 45
(c) 42
(d) 43

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Q38. What aids in preventing the mixing of oxygen-rich and carbon dioxide-rich blood in the heart?

(a) Aortic valve
(b) Tricuspid valve
(c) The wall between the chambers
(d) Pulmonary valve

Q39. What is the name of the holy book of Muslims, which describes the relationship between an omnipotent and omniscient God and his creations?

(a) Quran
(b) Injil
(c) Sahih al-Bukhari
(d) Torah

Q40. Fleming's right-hand rule can be used to determine the direction of induced current when the angle between the magnetic field and the motion of the conductor is:

(a) 30°
(b) 0°
(c) 180°
(d) 90°

Q41. Select the option that is related to the fifth number in the same way as the second number is related to the first number and the fourth number is related to the third number.

27 : 140 :: 22 : 115 :: 32 : ?

(a) 130
(b) 165
(c) 140
(d) 155

Q42. If '+' means '÷', '-' means '+', '×' means '-' and '÷' means '×', then, what will be the value of the following expression?

[{(12 × 3) - (2 ÷ 3)} + (1 - 4)] ÷ 4

(a) 12
(b) 16
(c) 9
(d) 8

Q43. 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)

(2, 4, 18)

(4, 6, 50)

(a) (2, 5, 49)
(b) (3, 5, 32)
(c) (5, 4, 18)
(d) (6, 7, 65)

Q44. All 65 students of a class are standing in a row facing the north. Amrit is 46^(th) from the extreme left end of the row, whereas Kashvi is 14^(th) from the extreme right end. How many students are standing between Amrit and Kashvi?

(a) 5
(b) 4
(c) 7
(d) 6

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Q45. A fruit vendor bought 800 apples for Rs. 4,800. He spent Rs. 800 on transportation. How much should he sell each to get a profit of Rs. 10 on each apple?

(a) Rs. 12
(b) Rs. 32
(c) Rs. 17
(d) Rs. 76

Q46. If x : 6 :: 6 : y, and x : y :: y : 6, then which of the options below gives the correct values of x and y, in that order?

(a) 12 and 12
(b) 12 and 6
(c) 6 and 6
(d) 6 and 12

Q47. The floor of an office has dimensions 5 m × 3 m. The cost of painting the walls and ceiling is Rs. 7,440 at the rate of Rs. 60/m². Find the height of the room (in m).(rounded off to one decimal place)

(a) 6.8
(b) 4.5
(c) 3.5
(d) 5.6

Q48. If each of the digits in the number given below is arranged in the descending order from left to right, what will be the sum of the digits that are second from the left and third from the right in the new number thus formed?

(Left) 259812357 (Right)

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

Q49. Six doctors, K, L, M, N, O and P, are sitting in a straight line. All are facing the north direction. Only O is sitting between N and L. Only P is sitting between L and K. K sits fifth to the right of M. Who is sitting to the immediate right of M?

(a) P
(b) O
(c) N
(d) L

Q50. The table given below shows the number of students who were interviewed and who got selected by the universities A, B, C and D over the years. Study the table and answer the question.

Students →	**A**	**B**	**C**	**D**				
Years ↓	Interviewed	Selected	Interviewed	Selected	Interviewed	Selected	Interviewed	Selected
2017	1500	700	1200	800	1800	1000	1200	750
2018	1600	800	1500	600	2000	1120	1400	460
2019	2200	900	2000	680	1800	1100	2000	500
2020	1500	950	1600	700	1800	1200	1500	450
2021	1100	400	1500	490	1300	800	1300	350

In university C, the total number of students selected over the years was approximately what percentage of the total number of students who were interviewed over the years?

(a) 60%
(b) 65%
(c) 40%

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(d) 50%

Q51. If the average of two numbers is 26 and one of them is 12, then find the other number.

(a) 40
(b) 20
(c) 52
(d) 14

Q52. The coefficient of x^4y³ in the expansion of $(3x - 2y)^2(x^2 + y^3)^2$ is:

(a) 18
(b) 15
(c) 12
(d) 14

Q53. In January 2022, which of these IITs launched the Global Center of Excellence in Affordable and Clean Energy (GCoE-ACE)?

(a) IIT Hyderabad
(b) IIT Dharwad
(c) IIT Roorkee
(d) IISc Bengaluru

Q54. Which of the following numbers will replace the question mark (?) in the given series?

5, 6, 14, 45, 184, ?

(a) 926
(b) 925
(c) 920
(d) 924

Q55. If the mean of the following data is 4, find the missing frequency.

x	3	5	9	2
f	3	4	•	8

(a) 7
(b) 3
(c) 4
(d) 5

Q56. A dealer sold three-fifth of his goods at a gain of 25% and the remaining at cost price. What is his loss or gain percent in the whole transaction?

(a) 15% gain
(b) 15% loss
(c) 18% gain
(d) 18% loss

Q57. Vishal is standing in a park facing the south direction. He then turns 90° clockwise on the same point. After that, he turns 45° clockwise. In which direction is he facing now?

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

Q58. 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.

QW _ R _ X E _ Q _ E R Q Z E _

(a) EQRER

(b) EQRYE
(c) EQRYR
(d) EQZYR

Q59. The Central Government of India has reduced Agricultural Infrastructure Development Cess (AIDC) on Crude Palm Oil (CPO) from 7.5% to _____ with effect from 12^(th) February 2022.
(a) 5%
(b) 3%
(c) 4%
(d) 6%

Q60. The laws of reflection hold true for which of the following mirror(s)?
(A) Concave mirror
(B) Convex mirror
(C) Plane mirror
(a) Only A and B
(b) Only A and C
(c) Only B and C
(d) A, B and C

Q61. The 'Bordoisila' storm occurs in which of the following Indian states?
(a) Kerala
(b) Assam
(c) Maharashtra
(d) Madhya Pradesh

Q62. 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.
STM : RUL
PJR : OKQ
(a) TCS : SDR
(b) VEW : UDV
(c) BUP : AVQ
(d) MTL : LUM

Q63. For what values of z will the following equation have equal roots?
$(z + 4)x^2 + (z + 1)x + 1 = 0$
(a) 2, -5
(b) 2, -3
(c) 5, -3
(d) 4, 3

Q64. The manufacturing of refrigerators that do not release chlorofluorocarbons has been made mandatory throughout the world. How will this help to prevent ozone depletion?
(a) It will reduce the release of CFCs that react with ozone molecules.
(b) It will help convert oxygen molecules into ozone.
(c) CFCs will change into ozone molecules.
(d) It will reduce the production of CFCs from oxygen molecules.

Q65. Six friends, Arun, Suresh, Rahul, Priyanka, Dilan and Hiba, took a test online. All of them scored different marks in the test. Suresh scored more than Priyanka but less than Arun. Hiba scored the least. Dilan scored less than Rahul. Arun scored more than Priyanka and Rahul. Who among the six scored the most?
(a) Rahul
(b) Priyanka
(c) Arun

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(d) Suresh

Q66. Rachna can eat 21 oranges in 60 minutes. She wants to know how many minutes it would take her to eat 35 oranges at the same pace?

(a) 80 min
(b) 100 min
(c) 90 min
(d) 120 min

Q67. How many tiers of administration are there in the Panchayati Raj Institutions (in states having a population more than 2 million)?

(a) 3
(b) 5
(c) 6
(d) 1

Q68. Two pipes A and B can fill a tank in 15 hours and 20 hours, respectively, while a third pipe C can empty the full tank in 30 hours. If all the three pipes operate simultaneously, in how much time will the tank, initially empty, be filled?

(a) 12 hours
(b) 15 hours
(c) 18 hours
(d) 13 hours

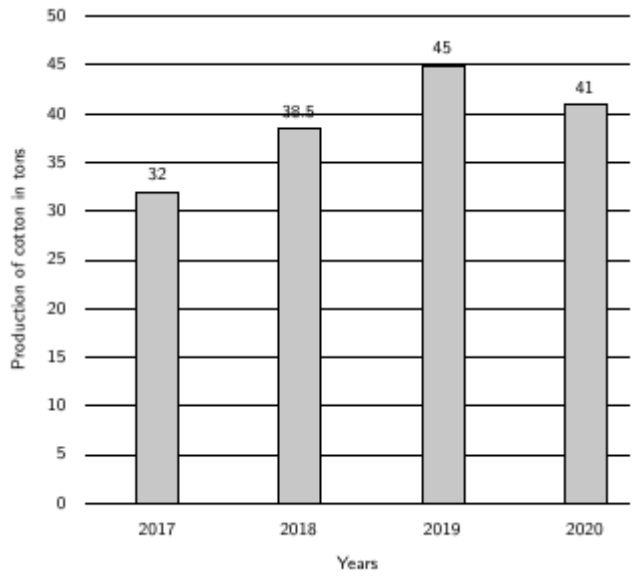
Q69. Pyruvate is formed from glucose in the _____ of a cell.

(a) mitochondria
(b) cytoplasm
(c) nucleus
(d) ribosome

Q70. Identify the INCORRECT order for the number of valence shell electrons.

(a) Na < Mg < Al < P < Ar
(b) Li < Be < B < C < N
(c) B < N < O < F < Ne
(d) Al < P < Si < S < Cl

Q71. The following bar graph shows the production of cotton (in tons) over the years. Study the graph and answer the question.



What is the approximate percentage increase in the production of cotton in 2020 as compared to 2017?

(a) 30.50%

(b) 28.12%
(c) 26%
(d) 25.05%

Q72. Which of the following organisms have spiracles?
(a) Earthworm
(b) Human
(c) Fish
(d) Cockroach

Q73. Find the value of (sin² θ - sin ^4 θ +1)/(1-sin² θ)+ (1-tan² θ - tan ^4 θ)/(1+tan² θ).
(a) 2
(b) 1
(c) 0
(d) -1

Q74. A father's age is seven times that of his son's age. Three years from now, the age of the father will be five times that of his son's age. What is the present age of the father?
(a) 45 years
(b) 42 years
(c) 39 years
(d) 36 years

Q75. Identify the correct relation between radius of curvature 'R', object distance 'u' and image distance 'v' for a spherical mirror.
(a) R = (2(u+v))/uv
(b) R = 2uv/(u+v)
(c) R = (u+v)/2uv
(d) R = uv/(2(u+v))

Q76. The value of √1234321=
(a) 1219
(b) 121
(c) 139
(d) 1111

Q77. If a substance loses hydrogen during a reaction, it is said to be:
(a) neutralised
(b) reduced
(c) oxidised
(d) decomposed

Q78. The Nubra, Shyok and Hunza are tributaries of the river _____.
(a) Ganga
(b) Indus
(c) Sutlej
(d) Brahmaputra

Q79. The value of 156.025 + 251.216 - 52.156 is:
(a) 355.085
(b) 302.152
(c) 326.327
(d) 332.074

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Q80. As of July 2022, under the “Nai Manzil' Scheme of the Ministry of Minority Affairs, the participant will get non-residential integrated education and skill training programme for 9 to 12 months of which a minimum _____ months should be devoted to skill training.

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

Q81. Two resistors R1 and R2 with resistances 2 Ω and 3 Ω, respectively, are connected in series to a 15V battery source. The current across R2 (in A) is:

(a) 3
(b) 7.5
(c) 15
(d) 5

Q82. Which of the following in Indian Constitution has been taken from the Constitution of the United States?

(a) Parliamentary Government
(b) Procedure Established by Law
(c) Fundamental Rights
(d) Fundamental Duties

Q83. The First Finance Commission was constituted vide Presidential Order dated 22.11.1951 under the chairmanship of _____.

(a) YV Reddy
(b) C Rangarajan
(c) Vijay Kelkar
(d) KC Neogy

Q84. What will be the next homologous series member of compound C6H10?

(a) C7H14
(b) C7H12
(c) C7H10
(d) C7H16

Q85. Find the arithmetic mean of the given data.

x	**10**	**20**	**30**	**40**	**50**
f	5	5	4	6	5

(a) 30.4
(b) 16.4
(c) 26.4
(d) 30.6

Q86. From total ____ elements, _____ elements were discovered through laboratory processes.

(a) 114, 22
(b) 118, 24
(c) 118, 26
(d) 114, 20

Q87. Six boxes A, B, C, D, E and F are arranged in a vertical column but not necessarily in the same order. B is placed at second position from the top. Only D is placed between A and B. E is at one of the positions below D and there is only one box between E and D. F is not at the bottom most position. Which box is placed at second position from the bottom?

(a) D
(b) E

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(c) C
(d) A

Q88. In which state of India can we find 'Khadins' for storing drinking water?
(a) Karnataka
(b) Gujarat
(c) West Bengal
(d) Rajasthan

Q89. Which of the following numbers will replace the question mark (?) in the given series?
9, 10, 22, 69, 280, ?
(a) 1405
(b) 560
(c) 576
(d) 1450

Q90. A ray of light is incident on an interface separating two media at an angle of incidence equal to 45°, for which the angle of refraction is 30°. The refractive index of the second medium with respect to first, is equal to:
(a) 1/√2
(b) √3/2
(c) √2
(d) 1/2

Q91. Find the amount Ravi needs to return to Monu, if he had borrowed Rs. 3,000 from Monu at 4% p.a. compound interest, compounded annually, 2 years ago.
(a) Rs. 3,244.80
(b) Rs. 2,344.80
(c) Rs. 4,321
(d) Rs. 3,453.90

Q92. The magnetic field lines inside a bar magnet are directed from:
(a) south pole to north pole
(b) north pole to south pole
(c) centre to south pole
(d) centre to north pole

Q93. Identify the correct statement(s) from among the following.
(a) Resistivity of a material is dependent on the nature of the material.
(b) Resistivity of a material is independent of the area of cross section.
(c) Resistivity of a pure metal is more than its alloy.
(a) Both (a) and (b)
(b) Both (b) and (c)
(c) Only (a)
(d) Only (b)

Q94. A light ray is travelling from air medium to water medium (refractive index = 1.3) such that angle of incidence is x degree and angle of refraction is y degree. The value of ratio (sin y)/ (sin x) is:
(a) 0.3
(b) 1.3
(c) 1
(d) 1/1.3

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Q95. Which of the following is the INCORRECT feature related to animal reproduction?

(a) Seminal vesicle is a gland present in human males
(b) In Amoeba, splitting of two cells takes place in any plane
(c) Fertilisation of egg takes place in the uterus in human female
(d) Regeneration is not the same as reproduction

Q96. Sujata is standing in a park facing the east direction. She then turns 135° anticlockwise. After that, she turns 90° anticlockwise. Then, she turns 45° clockwise. In which direction is she facing now?

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

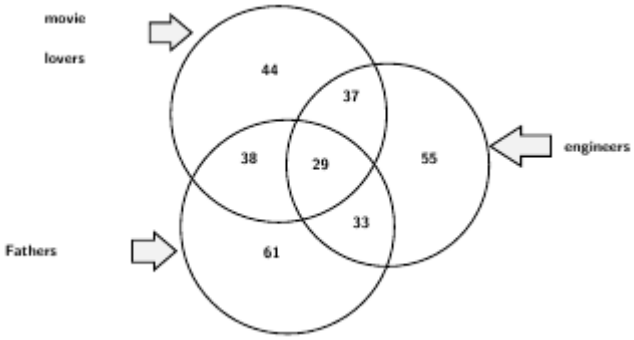
Q97. _____ is the chemical name of washing soda.

(a) Sodium carbonate decahydrate
(b) Sodium carbonate pentahydrate
(c) Sodium carbonate trihydrate
(d) Sodium carbonate tetrahydrate

Q98. Simplify $\sqrt{625}-\sqrt{324}+33^2$.

(a) 1906
(b) 1096
(c) 1609
(d) 1069

Q99. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



How many such fathers are there who are also movie lovers but NOT engineers?

(a) 44
(b) 38
(c) 29
(d) 61

Q100. Each of the digits in the number 318924765 is arranged in descending order from left to right. The position of how many digits will remain unchanged as compared to that in the original number?

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

ANSWER KEY

1	b	2	d	3	a	4	a	5	d	6	b	7	d	8	d	9	c	10	d
11	c	12	d	13	d	14	d	15	d	16	b	17	b	18	c	19	c	20	c

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

SOLUTIONS

Q1. Answer: (b) Second from the extreme left end

According to the given information,

1) U sits third to the left of R.

2) U sits second to the left of Q.

3) S sits third to the right of Q.

4) T is not the immediate neighbour of U.

Here, we can see that P is sitting second from the extreme left end.

Hence, the correct answer is "Second from the extreme left end".

Q2. Answer: (d) April

The correct answer is April

Key Points

• The policy norms for the Mission Vatsalya scheme implemented by the Ministry of Women and Child Development have been applicable from the 1st of April 2022.

• Mission Vatsalya is aimed at ensuring a healthy and happy childhood for every child in India.

• It focuses on the promotion of child rights, development, and protection.

• The scheme includes various initiatives to support children in need of care and protection, including those who are orphaned, abandoned, or surrendered.

• Mission Vatsalya also aims to strengthen the child protection ecosystem through the implementation of the Juvenile Justice (Care and Protection of Children) Act, 2015.

Additional Information

• Mission Vatsalya is part of a broader initiative by the Ministry of Women and Child Development to ensure the welfare and protection of children.

• The scheme works in conjunction with other child welfare programs such as the Integrated Child Development Services (ICDS) and the National Creche Scheme.

• It also collaborates with state governments, NGOs, and other stakeholders to create a supportive environment for children.

• The Ministry of Women and Child Development continuously monitors the implementation of the scheme to ensure its effectiveness and to make necessary adjustments.

• Mission Vatsalya emphasizes community participation and awareness to enhance the reach and impact of child protection measures.

Q3. Answer: (a) Two

The given series is: 4 T 6 $ 2 A D & C E 2 4 + & 7 6 U 5 H U K 8 E W @ E A & P

Number of vowels which are immediately preceded by a number and also immediately followed by a consonant:

→ 4 T 6 $ 2 (A) D & C E 2 4 + & 7 6 U 5 H U K 8 (E) W @ E A & P

Here, we can see that there are two such vowels.

Hence, the correct answer is "Two".

Q4. Answer: (a) Acetic acid

The correct answer is Acetic acid

Key Points

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• Acetic acid possesses the highest boiling point among the given compounds.
• This is due to the presence of strong hydrogen bonding in acetic acid, which requires more energy (higher temperature) to break.
• Boiling points of the given compounds are as follows:
• Acetic acid: 118°C
• Ethanol: 78°C
• Chloroform: 61°C
• Methane: -161.5°C
• The presence of hydrogen bonds in acetic acid leads to a higher boiling point compared to other compounds listed.

Additional Information

• Hydrogen bonding significantly influences the boiling points of compounds.
• Compounds with hydrogen bonds generally have higher boiling points compared to those without such bonds.
• Acetic acid (CH3COOH) is a carboxylic acid, and carboxylic acids typically have higher boiling points due to the formation of dimers through hydrogen bonding.
• Ethanol (C2H5OH) also forms hydrogen bonds, but its molecular weight and structure result in a lower boiling point compared to acetic acid.
• Chloroform (CHCl3) and methane (CH4) do not form hydrogen bonds, resulting in significantly lower boiling points.

Q5. Answer: (d) suberin

The correct answer is suberin

Key Points

• Suberin is a hydrophobic substance found in the cell walls of cork cells.
• It acts as a barrier to water and gases, making cork impermeable.
• Suberin is crucial for the protective function of cork, preventing the passage of water and gases through the cork tissue.
• This property of suberin makes cork an ideal material for sealing wine bottles and other applications where impermeability is required.

Additional Information

• Cork is harvested from the bark of the cork oak tree, primarily found in the Mediterranean region.
• The process of harvesting cork does not harm the tree, allowing it to continue growing and producing more cork over time.
• Cork is also known for its buoyant, elastic, and fire retardant properties.
• In addition to its use in wine stoppers, cork is used in flooring, insulation, and various other products.

Q6. Answer: (b) 3

The given series is: 2 5 2 6 5 2 2 6 3 8 9 5 6 3 6 2 2 5 5 3

Numbers in the series which are immediately preceded by an odd number and also immediately followed by an odd number:

→ 2 5 2 6 5 2 2 6 3 (8) 9 5 (6) 3 6 2 2 5 (5) 3

Here, we can see that there are 3 such numbers.

Hence, the correct answer is "3".

Q7. Answer: (d) 6

Shortcut Trick

Check divisibility by 6: A number must be divisible by both 2 and 3.

Last digit is 8 (even), so it is divisible by 2.

Sum of digits = 8 + 1 + 1 + 8 = 18. Since 18 is divisible by 3, the number is divisible by 3.

Since it is divisible by both 2 and 3, it is divisible by 6.

Therefore The correct answer is 6.

Alternate Method

Given: Number = 8118

Divisibility Rules Check:

=> Rule for 5: Last digit must be 0 or 5. Here it is 8. Not divisible.

=> Rule for 8: Last three digits (118) must be divisible by 8. 118 ÷ 8 = 14.75. Not divisible.

=> Rule for 7: 811 − (2 × 8) = 811 − 16 = 795. 795 ÷ 7 = 113.57. Not divisible.

=> Rule for 6: Check for 2 and 3.

=> Unit digit is 8 (even) → Divisible by 2.

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=> Sum of digits = 8 + 1 + 1 + 8 = 18. 18 is a multiple of 3 → Divisible by 3.
=> Result: 8118 ÷ 6 = 1353.
Therefore The correct answer is 6.
Additional Information
Divisibility by 4
A number is divisible by 4 if its last two digits are divisible by 4.
Divisibility by 9
A number is divisible by 9 if the sum of its digits is divisible by 9.
Divisibility by 11
Difference between the sum of digits at odd places and sum of digits at even places is either 0 or a multiple of 11.

Q8. Answer: (d) 60°

Shortcut Trick
For any regular polygon with n sides, the measure of each exterior angle is calculated as 360° ÷ n.
In a regular hexagon, the number of sides (n) is 6.
Applying the formula: Each exterior angle = 360° ÷ 6 = 60°.
Therefore The correct answer is 60°.
Alternate Method
Given: A regular hexagon (a polygon with 6 equal sides and 6 equal angles).
Formula Used:
1. Sum of all exterior angles of any convex polygon = 360°.
2. Each exterior angle of a regular polygon = 360° ÷ n (where n = number of sides).
Calculations:
=> Number of sides (n) = 6
=> Sum of all exterior angles = 360°
=> Each exterior angle = 360° ÷ 6
=> Each exterior angle = 60°
Alternatively, calculating via the interior angle:
=> Interior angle = [(n − 2) × 180°] ÷ n
=> Interior angle = [(6 − 2) × 180°] ÷ 6 = (4 × 180°) ÷ 6 = 120°
=> Exterior angle = 180° − Interior angle = 180° − 120° = 60°
Therefore The correct answer is 60°.
Additional Information
Sum of Exterior Angles
For any convex polygon with n sides, the sum of all its exterior angles (one at each vertex) is always constant at 360°.
Interior and Exterior Angle Relationship
At each vertex of a polygon, the interior angle and its corresponding exterior angle are supplementary, meaning they sum to 180°.
Sum of Interior Angles
The sum of the interior angles of a polygon with n sides is given by the formula (n − 2) × 180°.
Regular Polygons
In a regular polygon, all interior angles are equal and all exterior angles are equal. Common examples include equilateral triangles (n=3) and squares (n=4).

Q9. Answer: (c) Ø F L X ¥

Given:

Number/Symbol	**^**	**#**	**5**	**7**	**@**	**%**		**2**	**!**	**?**	**4**	**8**	**$**	**3**
Code	L	F	B	J	D	H	E	X	V	Z	K	U	R	P

Conditions	**Coded As**

First element is a symbol and the last a number	Codes for these two (the first and the last elements) are to be interchanged
First element is an odd number and the last element is a symbol	First and last elements are to be coded as Ø and ¥, respectively
Second and Third elements are perfect squares	Third element is to be coded as the code for the second element

Now, the group of numbers and symbols is: 7 # ^ 2 !

Here, Here, Second conditions followed in the given group,

So, codes of the First and last elements are to be coded as Ø.

Then, the code for '7 # ^ 2 !' is → 'Ø F L X ¥'.

Hence, the correct answer is "Option 3".

Q10. Answer: (d) 100080

Shortcut Trick

Check options for divisibility by 16 (since the number must be divisible by 8, 10, 12, and 16).

A number is divisible by 16 if its last four digits are divisible by 16.

For 100080: Last four digits 0080 are divisible by 16 (80 ÷ 16 = 5).

For 100080: It ends in 0 (divisible by 10) and sum of digits 1+8=9 (divisible by 3, hence 12).

Therefore The correct answer is 100080.

Alternate Method

Given: Divisors are 8, 10, 12, and 16. We need the least six-digit number.

Formula Used: Required number = Least 6-digit number + (LCM − Remainder)

=> First, find the LCM of 8, 10, 12, and 16.

=> $8 = 2^3$, $10 = 2 \times 5$, $12 = 2^2 \times 3$, 16 = 2^4

=> LCM = 2^4 × 3 × 5 = 16 × 15 = 240

=> Least 6-digit number = 1,00,000

=> Divide 1,00,000 by 240: 1,00,000 ÷ 240 => Remainder = 160

=> Required Number = 1,00,000 + (240 − 160)

=> Required Number = 1,00,000 + 80 = 1,00,080

Therefore The correct answer is 100080.

Additional Information

LCM (Least Common Multiple)

The smallest positive integer that is divisible by each of the given numbers. It is found by taking the highest power of all prime factors involved.

Divisibility Rule of 16

A number is divisible by 16 if the number formed by its last four digits is divisible by 16.

Finding N-digit Multiples

To find the smallest n-digit number divisible by x, calculate: Smallest n-digit number + (x − Remainder when smallest n-digit number is divided by x).

Q11. Answer: (c) 10 ml

The correct answer is 10 ml

Key Points

• 10 ml of the HCl solution is required to completely neutralize 10 ml of the NaOH solution.

• Since 5 ml of NaOH solution is neutralized by 5 ml of HCl solution, the ratio of neutralization is 1:1.

• Therefore, doubling the volume of NaOH solution to 10 ml will require doubling the volume of HCl solution to 10 ml to achieve complete neutralization.

• This is based on the principle of stoichiometry, where the amount of acid required to neutralize a base is directly proportional to the amount of base present.

Additional Information

• Neutralization Reaction: It is a chemical reaction in which an acid and a base react to form water and a salt, typically resulting in a solution that is neither acidic nor basic.

• Stoichiometry: It is the calculation of reactants and products in chemical reactions in chemistry. It shows the relationship between the quantities of reactants and products before, during, and after chemical reactions.

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• In the given problem, the balanced chemical equation for the neutralization reaction is:

NaOH + HCl → NaCl + H2O

• This equation indicates that one mole of NaOH reacts with one mole of HCl to produce one mole of NaCl and one mole of water.

• Thus, the volumes of NaOH and HCl solutions needed for neutralization are directly proportional, given that their concentrations remain constant.

Q12. Answer: (d) 1950 - 51

The correct answer is 1950 - 51

Key Points

• The first Economic Survey was presented as part of the Union Budget in the year 1950 - 51.

• The Economic Survey is an annual document released by the Ministry of Finance, Government of India, before the Union Budget.

• It provides a detailed account of the country's economic performance over the past year and outlines the economic outlook and policy challenges for the upcoming year.

• The Economic Survey is an important document for policymakers, economists, and the general public to understand the state of the economy.

Additional Information

• The Economic Survey is usually presented a day before the Union Budget in the Parliament.

• It is prepared under the guidance of the Chief Economic Adviser to the Government of India.

• The document comprises two parts: Part A deals with economic issues and policy options, while Part B provides statistical data on various economic indicators.

• The insights and data from the Economic Survey help in formulating the budget and economic policies for the upcoming fiscal year.

Q13. Answer: (d) 308π cm2

Shortcut Trick

Total Surface Area (TSA) of a cylinder = $2\pi r(r + h)$

Given radius (r) = 7 cm and height (h) = 15 cm.

TSA = $2 \times \pi \times 7 \times (7 + 15) = 14 \times \pi \times 22 = 308\pi$ cm².

Therefore The correct answer is 308π cm².

Alternate Method

Given:

=> Radius of the base (r) = 7 cm

=> Height of the cylinder (h) = 15 cm

Formula Used:

=> Total Surface Area = Curved Surface Area + 2 × Area of Base

=> Total Surface Area = $2\pi rh + 2\pi r^2 = 2\pi r(h + r)$

Calculations:

=> Total Surface Area = $2 \times \pi \times 7 \times (15 + 7)$

=> Total Surface Area = $14\pi \times 22$

=> Total Surface Area = 308π

Therefore The correct answer is 308π cm².

Additional Information

Curved Surface Area (CSA)

The area of the side surface excluding the top and bottom bases. Formula: CSA = $2\pi rh$.

Volume of Cylinder

The total space occupied by the cylinder. Formula: $V = \pi r^2 h$.

Hollow Cylinder

For a cylinder with outer radius R and inner radius r, the volume is $\pi(R^2 - r^2)h$.

Q14. Answer: (d) Replication of DNA

The correct answer is Replication of DNA

Key Points

• Replication of DNA is the fundamental event in reproduction as it ensures that genetic information is passed from one generation

to the next.

• During reproduction, DNA replication occurs to create a copy of the genetic material, which is then distributed to the daughter cells.

• This process is crucial for the maintenance of genetic continuity and variation within a species.

• Replication of DNA involves unwinding of the double helix, followed by the synthesis of new complementary strands by DNA polymerase enzymes.

• Errors during DNA replication can lead to mutations, which may affect the organism's development and function.

Additional Information

• Cell division is another critical process in reproduction, but it is driven by the replication of DNA.

• There are two main types of cell division: mitosis and meiosis. Mitosis results in two genetically identical daughter cells, while meiosis leads to the formation of gametes with half the genetic material.

• Understanding DNA replication has significant implications in fields such as genetics, medicine, and biotechnology.

Q15. Answer: (d) 2012

The logic followed here is :-

"A year is a leap year if it is divisible by 4."

However, for century years like 1600, 1700, 1800, etc., it must be divisible by 400 to be considered a leap year.

Let's check the given options:

2006 is not divisible by 4.

2002 is not divisible by 4.

2018 is not divisible by 4.

2012 is divisible by 4.

Thus, the correct answer is "2012".

Q16. Answer: (b) Only assumption II is implicit

Given Statement: Many people could not reach their work places due to the strike by transport workers, which has brought bus services to a complete halt.

Now,

Assumptions:

1. Citizens should be using the metro rail services more - Not Implicit (The statement does not mention anything about metro rail services or suggest their use as an alternative.)

2. Many people are dependent on bus services to travel to their work place - Implicit (The statement clearly indicates that many people could not reach their workplaces because the bus services were halted, implying their dependence on the buses.)

Here, Only assumption II is implicit.

Hence, the correct answer is "Option 2".

Q17. Answer: (b) Anju Bobby George

The correct answer is Anju Bobby George

Key Points

• Anju Bobby George won the Woman of the Year Award by World Athletics in December 2021.

• She was recognized for her efforts in grooming talent and encouraging young girls in India to take up sports and fight for gender equality.

• Anju Bobby George is a celebrated Indian athlete, known for her achievements in long jump.

• Her contribution to sports extends beyond her own achievements as she has been actively involved in mentoring and supporting young athletes.

Additional Information

• Anju Bobby George made history by winning the bronze medal at the 2003 World Championships in Athletics in Paris, making her the first Indian athlete to win a medal in a World Championships in Athletics.

• She has also won the gold medal at the IAAF World Athletics Final in 2005.

• Through her academy, she continues to contribute to the development of athletics in India.

• Her recognition by World Athletics highlights her significant role in promoting sports and gender equality in India.

Q18. Answer: (c) Taj Mahotsav

The correct answer is Taj Mahotsav

Key Points

• Taj Mahotsav is a ten-day cultural festival of India celebrated at Shilpgram.
• The festival takes place every year between February and March.
• It showcases classical dance, folk art, and light music, attracting artists and performers from across the country.
• The event is organized by the Uttar Pradesh Tourism Department and aims to promote the rich cultural heritage of India.

Additional Information

• Shilpgram is a crafts village located near the Taj Mahal in Agra, Uttar Pradesh.
• The festival not only highlights traditional arts and crafts but also includes a vibrant display of cuisine, carnival rides, and various other forms of entertainment.
• The Taj Mahotsav is a significant event for artisans and craftsmen, providing them with a platform to showcase and sell their work.
• The festival was first held in 1992 and has since become an annual feature, drawing both domestic and international tourists.

Q19. Answer: (c) Circle

Shortcut Trick

A quadrilateral is a polygon with exactly four straight sides.

Check the options: Rhombus (4), Parallelogram (4), and Trapezium (4) all have four sides.

A Circle has a curved boundary and zero straight sides.

Therefore The correct answer is Circle.

Alternate Method

Given: Geometric shapes: Rhombus, Parallelogram, Circle, and Trapezium.

Definition: A quadrilateral is a closed two-dimensional shape which has four straight sides, four vertices, and four interior angles.

=> Rhombus: A quadrilateral with all four sides equal => Quadrilateral.

=> Parallelogram: A quadrilateral with two pairs of parallel sides => Quadrilateral.

=> Trapezium: A quadrilateral with at least one pair of parallel sides => Quadrilateral.

=> Circle: A round plane figure whose boundary consists of points equidistant from a fixed center. It has no straight sides.

Therefore The correct answer is Circle.

Additional Information

Polygon Classification

Polygons are named based on their side count: Triangle (3), Quadrilateral (4), Pentagon (5), Hexagon (6), etc.

Sum of Interior Angles

The sum of the interior angles of any quadrilateral is always 360°, calculated using the formula (n − 2) × 180° where n = 4.

Circle Properties

Q20. Answer: (c) Ø F P X D Ø

Given:

Number/Symbol	**8**	**=**	**4**	**7**	**@**	**%**		**2**	**!**	**?**	**5**	**3**	**<**	**9**
Code	Z	F	T	J	D	H	E	X	V	W	K	U	P	A

Conditions	**Coded As**
First element is a symbol and the last a number	Codes for these two (the first and the last elements) are to be interchanged
First element is an odd number and the last element is an even number	First and last elements are to be coded as Ø
Second and Third elements are perfect squares	Third element is to be coded as the code for the second element

Now, the group of numbers and symbols is: 3 = < 2 @ 8

Here, Here, Second conditions followed in the given group,

So, codes of the First and last elements are to be coded as Ø.

Then, the code for '3 = < 2 @ 8' is → 'Ø F P X D Ø'.

Hence, the correct answer is "Option 3".

Q21. Answer: (c) 2

Shortcut Trick

For any quadratic equation, if the roots are reciprocals of each other, then the product of the roots is 1, which means C = A.

Comparing with the given equation, A = a + 3 and C = 7 − a.

=> 7 − a = a + 3

=> 2a = 4

=> a = 2

Therefore The correct answer is 2.

Alternate Method

Given:

Quadratic equation: $(a + 3)x^2 - 13ax + 7 - a = 0$

One root is the reciprocal of the other.

Formula Used:

For a standard quadratic equation $Ax^2 + Bx + C = 0$, the product of roots is given by C/A.

Calculations:

Let the roots of the given quadratic equation be α and 1/α.

Comparing the given equation with $Ax^2 + Bx + C = 0$:

=> A = a + 3

=> B = −13a

=> C = 7 − a

Since the roots are reciprocals of each other, their product is:

=> Product of roots = α × (1/α) = 1

=> C / A = 1

=> (7 − a) / (a + 3) = 1

=> 7 − a = a + 3

=> 2a = 4

=> a = 2

Therefore The correct answer is 2.

Additional Information

Reciprocal Roots Condition

In any quadratic equation $Ax^2 + Bx + C = 0$, the roots are reciprocals of each other if and only if the coefficient of x^2 equals the constant term, i.e., A = C.

Roots Equal in Magnitude but Opposite in Sign

The roots are equal in magnitude but opposite in sign if the coefficient of x is zero, i.e., B = 0.

Sum and Product of Roots

For the quadratic equation $Ax^2 + Bx + C = 0$, the sum of roots is −B/A and the product of roots is C/A.

Q22. Answer: (c) New Delhi

The correct answer is New Delhi

Key Points

• The Archaeological Survey of India (ASI) is headquartered in New Delhi.

• The ASI is an Indian government agency attached to the Ministry of Culture, responsible for archaeological research and the conservation and preservation of cultural monuments in the country.

• It was founded in 1861 by Alexander Cunningham who also became its first Director-General.

• The ASI maintains ancient monuments and archaeological sites and remains of national importance.

Additional Information

• The Archaeological Survey of India was established in the year 1861 by the British Raj.

• The primary objective of the ASI is to explore, excavate, conserve, preserve, and protect the monuments and sites of national and international importance.

• The ASI also regulates the Antiquities and Art Treasures Act, 1972.

• It has a large collection of artifacts, sculptures, coins, and inscriptions collected from various sites across India.

• Besides New Delhi, ASI has several regional offices across the country.

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Q23. Answer: (a) Ministry of Ayush

The correct answer is Ministry of Ayush

Key Points

• The Ministry of Ayush has launched the world's first multicentre phase III clinical trial to assess Ayurveda's efficacy in Rheumatoid Arthritis treatment.

• This initiative is a significant step in integrating traditional Indian medicine with modern medical practices.

• The clinical trial aims to provide scientific validation and global recognition to Ayurveda's potential in treating chronic conditions.

• It reflects the government's commitment to promoting and supporting traditional Indian medicine systems.

Additional Information

• The Ministry of Ayush was formed in November 2014 to ensure the optimal development and propagation of Ayush systems of healthcare.

• Ayush stands for Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy.

• Rheumatoid Arthritis is a chronic inflammatory disorder that typically affects the small joints in hands and feet.

• Integrating Ayurveda in mainstream healthcare can potentially reduce the dependency on conventional drugs and their side effects.

• The ministry is also involved in various other research and development activities to validate and promote traditional Indian medicine on a global platform.

Q24. Answer: (b) 6

The correct answer is 6

Key Points

• 6 Prime Ministers of India have served as Chief Ministers of their respective states up to June 2022.

• These Prime Ministers include Morarji Desai, Charan Singh, V. P. Singh, P. V. Narasimha Rao, H. D. Deve Gowda, and Narendra Modi.

• The experience gained as Chief Ministers often contributes to their governance style and policies at the national level.

• Having served at both state and national levels, these leaders bring a comprehensive understanding of the political landscape in India.

Additional Information

• Morarji Desai served as the Chief Minister of Bombay State before becoming the Prime Minister.

• Charan Singh was the Chief Minister of Uttar Pradesh before his tenure as Prime Minister.

• V. P. Singh held the position of Chief Minister of Uttar Pradesh before becoming the Prime Minister.

• P. V. Narasimha Rao served as the Chief Minister of Andhra Pradesh.

• H. D. Deve Gowda was the Chief Minister of Karnataka before becoming the Prime Minister.

• Narendra Modi served as the Chief Minister of Gujarat before his tenure as Prime Minister.

• This diverse experience helps in addressing both state and national issues with a balanced perspective.

Q25. Answer: (a) 54/11

Shortcut Trick

Rate of Pipe A = 1000 ÷ 5 = 200 L/hr.

Rate of Pipe B = 1000 ÷ 6 = 500/3 L/hr.

Combined rate of (A + B) = 200 + 500/3 = 1100/3 L/hr.

Time to fill 1800 L = 1800 ÷ (1100/3) = (1800 × 3) ÷ 1100 = 54/11 hr.

Therefore The correct answer is 54/11 hr.

Alternate Method

Given:

Capacity 1 = 1000 litres, Time A = 5 hr, Time B = 6 hr.

Target Capacity = 1800 litres.

Formula Used:

Efficiency (Rate) = Work (Capacity) ÷ Time

Total Time = Required Work ÷ Combined Efficiency

Pipe	Time (hr)	Work (Litres)	Efficiency (L/hr)
Pipe A	5	1000	200

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Pipe B	6	500/3	

=> Efficiency of Pipe A = 1000 ÷ 5 = 200 L/hr

=> Efficiency of Pipe B = 1000 ÷ 6 = 500/3 L/hr

=> Combined Efficiency (A + B) = 200 + 500/3 = (600 + 500) ÷ 3 = 1100/3 L/hr

=> Time required to fill 1800 L = Required Capacity ÷ Combined Efficiency

=> Time = 1800 ÷ (1100/3) = 1800 × 3 ÷ 1100

=> Time = 5400 ÷ 1100 = 54/11 hr

Therefore The correct answer is 54/11 hr.

Additional Information

Pipes and Cisterns Basics

Inlet pipes perform positive work while outlet or leak pipes perform negative work. The net rate is the algebraic sum of individual rates.

Combined Time Formula

If two pipes fill the same volume in x and y hours respectively, the time taken together is (x × y) ÷ (x + y).

Efficiency and Time Relation

Efficiency is inversely proportional to the time taken to complete a fixed amount of work (E1/E2 = T2/T1).

Q26. Answer: (a) Only i

The correct answer is Only i.

Key Points

i. Ionic compounds have low melting and boiling points.

• Explanation: This statement is incorrect. Ionic compounds have high melting and boiling points due to the strong electrostatic forces of attraction between the oppositely charged ions. These forces require a significant amount of energy to break.

ii. Ionic compounds are brittle and break into pieces when pressure is applied.

• Explanation: This statement is correct. While it is true that ionic compounds are brittle, it is because the ions are arranged in a rigid lattice structure.

iii. Ionic compounds are solids and are somewhat hard because of the strong force of attraction between the positive and negative ions.

• Explanation: This statement is true. The strong electrostatic forces of attraction between the ions hold them in a rigid structure, making ionic compounds solid and relatively hard.

iv. Ionic compounds conduct electricity in the molten state.

• Explanation: This statement is true. In the molten state, the ions in an ionic compound are free to move, allowing them to conduct electricity.

Q27. Answer: (b) 10

The correct answer is 10.

Key Points

• Ohm's Law states that V = I × R, where V is the potential difference, I is the current, and R is the resistance.

• Given the current of 5 A and resistance of 2 Ω, the potential difference across the conductor is 10 V.

• This calculation uses basic electrical principles and is essential in understanding how voltage is related to current and resistance.

• In this scenario, current (5 A) and resistance (2 Ω) directly determine the voltage across the conductor.

Additional Information

• Ohm's Law: Ohm's Law is a fundamental equation in electrical engineering that explains the relationship between voltage, current, and resistance in a circuit.

• Units of measurement: Current (I) is measured in amperes (A), resistance (R) in ohms (Ω), and voltage (V) in volts (V).

• Practical applications: This law is widely used to calculate voltage drops in electrical circuits, aiding in designing and troubleshooting electrical systems.

• Power Calculation: Voltage (V) is also crucial for calculating power in a circuit using the formula P = V × I, where P is power in watts (W).

• Electrical Conductivity: The resistance value determines the ease with which a conductor allows current to pass, influencing its potential difference in circuits.

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Q28. Answer: (a) It is the plots of quantities demanded at various time.

The correct answer is option 1

Key Points

• The demand curve is a graphical representation showing the relationship between the price of a good and the quantity demanded.

• It reflects the law of demand, which states that, all else being equal, as the price of a product decreases, the quantity demanded increases, and vice versa.

• The demand curve is usually negatively sloped, indicating the inverse relationship between price and quantity demanded.

• Option 1 is incorrect because the demand curve does not plot quantities demanded at various times but at various prices.

Additional Information

• The concept of the demand curve is fundamental in economics and is used to analyze consumer behavior and market dynamics.

• Changes in factors other than price, such as consumer preferences, income, and prices of related goods, can shift the demand curve.

• A rightward shift in the demand curve indicates an increase in demand, while a leftward shift indicates a decrease in demand.

• Understanding the demand curve is crucial for businesses and policymakers to make informed decisions regarding pricing, production, and policy formulation.

Q29. Answer: (c) Only conclusion I is true

Given Statement: F = E ≥ D = A > Z < S = O

Now,

Conclusions:

Option 1: F ≥ D → True (F = E ≥ D)

Option 2: D < O → False (D = A > Z < S = O, No relation can be established between D and O)

SO, Only conclusion I is true.

Hence, the correct answer is "Option 3".

Q30. Answer: (b) 68

The number of people who are gardeners but not engineers in the given figure is shown below,

Hence, the correct answer is "68".

Q31. Answer: (b) 4

Given: (left) 448 455 275 563 215 (right)

The third digit of the largest number is: 3 (563)

And,

The second digit of the smallest number is: 1 (215)

So, the addition of the third digit of the largest number and the second digit of the smallest number is:

→ 3 + 1 = 4

The correct answer is "Option 2".

Q32. Answer: (a) Brahmaputra River

The correct answer is Brahmaputra River

Key Points

• Umananda Island is situated on the Brahmaputra River in the state of Assam, India.

• It is considered the smallest inhabited riverine island in the world.

• The island is known for the Umananda Temple, dedicated to Lord Shiva, which attracts many pilgrims and tourists.

• Umananda Island is also known as Peacock Island due to its picturesque and serene environment.

• Regular ferry services are available from the banks of the Brahmaputra to reach the island.

Additional Information

• The Brahmaputra River is one of the major rivers of India, originating from Tibet and flowing through India and Bangladesh.

• The river is known for its strong currents and is prone to flooding during the monsoon season.

• It plays a crucial role in the agriculture and economy of the regions it flows through, particularly in Assam.

• The Brahmaputra is also significant for its rich biodiversity, supporting various species of flora and fauna.

• Efforts are continuously made to preserve the ecological balance and prevent pollution in the river.

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Q33. Answer: (c) one

Shortcut Trick

Compare the ratios of the coefficients of x and y directly.

Ratio for x (a1/a2) = 5/7

Ratio for y (b1/b2) = −3/4

Since 5/7 ≠ −3/4, the equations represent intersecting lines with exactly one unique solution.

Therefore The correct answer is one.

Alternate Method

Given:

Equation 1: 5x − 3y = 7

Equation 2: 7x + 4y = 18

Formula Used:

For a general pair of linear equations a1x + b1y = c1 and a2x + b2y = c2:

Condition for exactly one solution: a1/a2 ≠ b1/b2

Calculations:

=> Comparing the given equations with the standard form, we get:

=> a1 = 5, b1 = −3, c1 = 7

=> a2 = 7, b2 = 4, c2 = 18

=> Ratio of coefficients of x = a1/a2 = 5/7

=> Ratio of coefficients of y = b1/b2 = −3/4

=> We can observe that 5/7 ≠ −3/4

=> The condition a1/a2 ≠ b1/b2 is fully satisfied.

=> Therefore, the pair of linear equations has exactly one unique solution.

Therefore The correct answer is one.

Additional Information

Intersecting Lines (Unique Solution)

When a1/a2 ≠ b1/b2, the two lines intersect at exactly one point, providing a unique solution to the system.

Coincident Lines (Infinitely Many Solutions)

When a1/a2 = b1/b2 = c1/c2, the two lines overlap completely, meaning every point on the line is a solution.

Parallel Lines (No Solution)

When a1/a2 = b1/b2 ≠ c1/c2, the two lines are parallel and never intersect, resulting in zero possible solutions.

Q34. Answer: (c) Unnati Hooda

The correct answer is Unnati Hooda

Key Points

• Unnati Hooda became the youngest ever Indian to win a BWF Super 100 tournament in 2022.

• She achieved this milestone at the age of just 14 years.

• The tournament victory was a significant achievement in Indian badminton, showcasing her potential and talent at a young age.

• Unnati Hooda's victory is seen as an inspiration for many young athletes in India.

Additional Information

• The BWF Super 100 tournaments are part of the Badminton World Federation's circuit and are considered prestigious events.

• Winning a BWF Super 100 tournament can significantly boost a player's international ranking and open up opportunities for further competitions.

• India has been producing a number of talented badminton players who have made their mark on the international stage in recent years.

• Unnati Hooda's victory adds to the growing list of Indian badminton successes on the global platform.

Q35. Answer: (a) 1974

The correct answer is 1974

Key Points

• The first nuclear test conducted by the Indian government was in the year 1974.

• This test was code-named "Smiling Buddha" and was carried out in the deserts of Pokhran, Rajasthan.

• It marked India's entry into the group of countries possessing nuclear weapons.

• The test was conducted on 18th May 1974, under the leadership of Prime Minister Indira Gandhi.

• The success of this test demonstrated India's advanced scientific capabilities and strategic strength.

Additional Information

• The test site at Pokhran was chosen for its remote location to ensure security and secrecy.

• Following the test, India faced international sanctions but continued to develop its nuclear program.

• India's nuclear policy is guided by the principle of "No First Use", which means it will only use nuclear weapons in retaliation to a nuclear attack.

• The success of the 1974 test paved the way for subsequent tests, including the series of tests conducted in 1998, known as Pokhran-II.

Q36. Answer: (a) None of the conclusions follow

The least possible venn diagram is shown below,

Conclusions:

(I) Some shelters are hotels → False (Some gates are hotels, and some shelters are gates implies that some shelters can be hotels. This is possible but not definite).

(II) All hotels are gates → False (Some gates are hotels implies that all hotels can be gates. This is possible but not definite).

Hence, the correct answer is "None of the conclusions follow".

Q37. Answer: (d) 43

The logic followed here is:

Let the position of Janhvi be J and the position of Pranitha be P.

Only 26 students are standing between Janhvi and Ravi, so the total number of students including Janhvi and Ravi would be 26 + 2 = 28.

Similarly, only 14 students are standing between Ravi and Pranitha, so the total number of students including Ravi and Pranitha would be 14 + 2 = 16.

Now, since Ravi is counted in both intervals, we need to subtract the overlap to avoid double counting Ravi:

Total number of students = 28 + 16 - 1

= 44 - 1 = 43

Hence, the correct answer is "Option 4".

Q38. Answer: (c) The wall between the chambers

The correct answer is The wall between the chambers

Key Points

• The wall between the chambers of the heart, known as the septum, is responsible for preventing the mixing of oxygen-rich and carbon dioxide-rich blood.

• The heart is divided into four chambers: two atria and two ventricles. The septum separates the left and right sides of the heart.

• The left side of the heart contains oxygen-rich blood, while the right side contains carbon dioxide-rich blood.

• This separation ensures that oxygenated blood is efficiently delivered to the body, while deoxygenated blood is sent to the lungs for oxygenation.

Additional Information

• The heart valves (aortic valve, tricuspid valve, and pulmonary valve) play crucial roles in regulating blood flow direction but do not prevent the mixing of blood between the chambers.

• The septum is divided into two parts: the atrial septum (between the atria) and the ventricular septum (between the ventricles).

• A defect in the septum, such as a septal defect, can lead to the mixing of oxygen-rich and carbon dioxide-rich blood, which can be a serious medical condition.

Q39. Answer: (a) Quran

The correct answer is Quran

• The holy book of Muslims is called the Quran.

• The Quran describes the relationship between an omnipotent and omniscient God and His creations.

• It is considered the ultimate source of guidance for Muslims, encompassing various aspects of life, including theology, morality, and law.

• The Quran is written in classical Arabic and is divided into chapters called Surahs, which are further divided into verses called Ayahs.

• The Quran was revealed to the Prophet Muhammad over a period of approximately 23 years, beginning in 610 CE and

concluding in 632 CE.

• It is regarded as the final revelation from God, following previous scriptures such as the Torah and the Injil (Gospel).

• Muslims believe that the Quran has remained unchanged since its revelation and is preserved in its original language.

• Recitation and memorization of the Quran are highly emphasized in Islamic tradition.

• The Quran addresses a wide range of topics, including the nature of God, the purpose of human existence, ethical conduct, and legal principles.

Q40. Answer: (d) 90°

The correct answer is Option 4

Key Points

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

• According to the rule, when the thumb, forefinger, and middle finger of the right hand are held perpendicular to each other:

• The thumb represents the direction of the motion of the conductor.

• The forefinger represents the direction of the magnetic field.

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

• Fleming's right-hand rule is most effective when the angle between the magnetic field and the motion of the conductor is 90º.

• This is because, at 90º, the conductor cuts through the maximum number of magnetic field lines, inducing the maximum current.

Additional Information

• Fleming's right-hand rule is different from Fleming's left-hand rule, which is used for electric motors to find the direction of force acting on a current-carrying conductor in a magnetic field.

• Michael Faraday's law of electromagnetic induction is the principle behind Fleming's right-hand rule.

• Faraday's law states that a change in magnetic field within a closed loop induces an electromotive force (EMF) in the conductor.

• Understanding these principles is crucial for applications in electrical engineering and physics, such as in the design of electric generators and transformers.

Q41. Answer: (b) 165

The logic followed here is:

Logic: (1st number × 5) + 5 = 2nd number.

Now,

For, 27 : 140

=> (27 × 5) + 5 = 135 + 5 = 140.

For, 22 : 115

=> (22 × 5) + 5 = 110 + 5 = 115.

Similarly, for 32 : ?

=> (32 × 5) + 5 = 160 + 5 = 165.

Hence, the correct answer is "Option 2".

Q42. Answer: (a) 12

Given Equation: [{(12 × 3) - (2 ÷ 3)} + (1 - 4)] ÷ 4

BODMAS Rule:

Decoding the given information:

Symbol	•	•	×	÷
Meaning	÷	•	•	×

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

=> [{(12 - 3) + (2 × 3)} ÷ (1 + 4)] × 4

=> [{(9 + 6} ÷ (1 + 4)] × 4

=> [15 ÷ 5] × 4

=> 3 × 4 = 12.

Hence, the correct option is "Option 1".

Q43. Answer: (b) (3, 5, 32)

The logic followed here is:

Logic: (1st number + 2nd number) × [(1st number + 2nd number) ÷ 2] = 3rd number.

Now,
For, (2, 4, 18):
=> (2 + 4) × [(2 + 4) ÷ 2]
=> 6 × [6 ÷ 2]
=> 6 × 3 = 18.
For, (4, 6, 50):
=> (4 + 6) × [(4 + 6) ÷ 2]
=> 10 × [10 ÷ 2]
=> 10 × 5 = 50.
Similarly, for, (3, 5, 32):
=> (3 + 5) × [(3 + 5) ÷ 2]
=> 8 × [8 ÷ 2]
=> 8 × 4 = 32.
Hence, the correct answer is "Option 2".

Q44. Answer: (a) 5

The logic followed here is:
Position of Amrit from the left = 46th
Position of Kashvi from the right = 14th
Total number of students = 65
Position of Kashvi from the left = Total number of students - Position of Kashvi from the right + 1
= 65 - 14 + 1 = 52
So,
Number of students between Amrit and Kashvi = Position of Kashvi from the left - Position of Amrit from the left - 1
= 52 - 46 - 1
= 5
Hence, the correct answer is "Option 1".

Q45. Answer: (c) Rs. 17

Shortcut Trick
Effective Cost Price (CP) of 800 apples = 4,800 + 800 = Rs. 5,600.
CP per apple = 5,600 ÷ 800 = Rs. 7.
Desired Profit per apple = Rs. 10.
Selling Price (SP) per apple = CP per apple + Profit per apple = 7 + 10 = Rs. 17.
Therefore The correct answer is Rs. 17.
Alternate Method
Given → Total Apples = 800, Purchase Price = Rs. 4,800, Overhead = Rs. 800, Target Profit = Rs. 10 per apple.
Formulas: Total CP = Purchase Price + Overheads | CP per unit = Total CP ÷ Total Quantity | SP = CP + Profit.
=> Total Cost Price (CP) = Rs. 4,800 + Rs. 800 = Rs. 5,600.
=> Cost Price per apple = 5,600 ÷ 800 = Rs. 7.
=> Required Selling Price (SP) per apple = 7 + 10 = Rs. 17.
Therefore The correct answer is Rs. 17.
Additional Information
Overhead Charges
Expenses like transportation, labor, or repairs are added to the purchase price to calculate the Effective Cost Price.
Profit on Each Unit
Total Profit = Profit per unit × Total Quantity. In this case, Total Profit = 10 × 800 = Rs. 8,000.

Q46. Answer: (c) 6 and 6

Shortcut Trick
From the first proportion x : 6 :: 6 : y, we get xy = 36.
From the second proportion x : y :: y : 6, we get $y^2 = 6x$.
Substitute x = 36/y into the second equation: $y^2 = 6 \times (36/y) \Rightarrow y^3 = 216 \Rightarrow y = 6$.

Then x = 36/6 = 6.
Therefore The correct answer is 6 and 6.
Alternate Method
Given: x : 6 :: 6 : y and x : y :: y : 6
Formula Used: Product of extremes = Product of means (a : b :: c : d => ad = bc)
=> Case 1: x : 6 :: 6 : y
=> x × y = 6 × 6 => xy = 36 --- (Equation 1)
=> Case 2: x : y :: y : 6
=> x × 6 = y × y => 6x = y^2 --- (Equation 2)
=> From (1), x = 36/y. Putting this in (2):
=> 6 × (36/y) = y^2
=> 216 = y^3
=> y = 6
=> Substituting y = 6 in (1): x × 6 = 36 => x = 6
Therefore The correct answer is 6 and 6.
Additional Information
Mean Proportional
If a : b :: b : c, then b is the mean proportional between a and c, where b^2 = ac.
Third Proportional
In the proportion a : b :: b : c, c is called the third proportional to a and b, calculated as c = b^2/a.
Fourth Proportional
In the proportion a : b :: c : d, d is called the fourth proportional, calculated as d = (b × c) / a.

Q47. Answer: (a) 6.8

Shortcut Trick
Total Area = Total Cost ÷ Rate = 7440 ÷ 60 = 124 m^2.
Area of Ceiling = Length × Breadth = 5 × 3 = 15 m^2.
Area of 4 walls = 124 − 15 = 109 m^2.
Height (h) = Area of 4 walls ÷ [2 × (l + b)] = 109 ÷ [2 × (5 + 3)] = 109 ÷ 16 ≈ 6.8 m.
Therefore The correct answer is 6.8 m.
Alternate Method
Given:
Length (l) = 5 m, Breadth (b) = 3 m
Total Cost = Rs. 7,440, Rate = Rs. 60/m^2
Formula Used:
Total Area = Area of 4 walls + Area of ceiling
Area of 4 walls = 2h(l + b)
Area of ceiling = l × b
Calculations:
=> Total Area to be painted = 7440 ÷ 60 = 124 m^2
=> Area of ceiling = 5 × 3 = 15 m^2
=> Area of 4 walls = 124 − 15 = 109 m^2
=> 2h(5 + 3) = 109
=> 2h(8) = 109
=> 16h = 109
=> h = 109 ÷ 16 = 6.8125 m
=> h ≈ 6.8 m
Therefore The correct answer is 6.8 m.
Additional Information
Lateral Surface Area (LSA)
For a cuboid room, the area of the 4 walls is also called the Lateral Surface Area, calculated as 2 × height × (length + breadth).
Total Surface Area (TSA)

The total surface area of a room including floor and ceiling is 2(lb + bh + hl). In painting problems, the floor is usually excluded.

Volume of Cuboid

The space inside the room is given by Volume = length × breadth × height (l × b × h).

Q48. Answer: (c) 10

Given number: '259812357'

After arranging the digits in descending order:

Original Digits	**2**	**5**	**9**	**8**	**1**	**2**	**3**	**5**	**7**
Descending Order	9	8	7	5	5	3	2	2	1

After arranging in descending order,

Second digit from the left end is: 8,

Third digit from the right end is: 2,

Now,

Sum of the digits 8 and 2 is: 8 + 2 = 10.

Hence, the correct answer is "Option 3".

Q49. Answer: (c) N

According to the given information,

1) K sits fifth to the right of M.

2) Only P is sitting between L and K.

3) Only O is sitting between N and L.

Here, we can see that N is sitting to the immediate right of M.

Hence, the correct answer is "N".

Q50. Answer: (a) 60%

Formula Used:

Percentage = ((Total Selected)/(Total Interviewed)) × 100

Calculation:

Total number of students selected by University C over the years:

=> 1000 + 1120 + 1100 + 1200 + 800 = 5220

Total number of students interviewed by University C over the years:

=> 1800 + 2000 + 1800 + 1800 + 1300 = 8700

Percentage of students selected by university C:

=> (5220/8700) × 100

=> (5220/8700) × 100 ≈ 60%

Hence, the correct answer is option 1.

Q51. Answer: (a) 40

Shortcut Trick

Total Sum = Average × Number of terms

Total Sum = 26 × 2 = 52

Other Number = Total Sum − Given Number

Other Number = 52 − 12 = 40

Therefore The correct answer is 40.

Alternate Method

Given:

Average of two numbers = 26

First number (n1) = 12

Formula Used:

Average = (Sum of observations) ÷ (Total number of observations)

Calculations:

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=> Let the other number be x.

=> (12 + x) ÷ 2 = 26

=> 12 + x = 26 × 2

=> 12 + x = 52

=> x = 52 − 12

=> x = 40

Therefore The correct answer is 40.

Additional Information

Sum of Observations

To find the total value when the average is known, use the formula: Sum = Average × Count.

Arithmetic Mean

The arithmetic mean (average) is the central value of a finite set of numbers, calculated as the sum of all terms divided by the number of terms.

Property of Deviation

The sum of the deviations of all observations from their arithmetic mean is always zero. In this case, (12 − 26) + (40 − 26) = −14 + 14 = 0.

Q52. Answer: (a) 18

Shortcut Trick

To find the coefficient of x^4y³, expand each squared term partially.

$(3x - 2y)^2 \rightarrow (3x)^2 - 12xy + 4y^2 = 9x^2 - 12xy + 4y^2$

$(x^2 + y^3)^2 \rightarrow (x^2)^2 + 2(x^2)(y^3) + (y^3)^2 = x^4 + 2x^2y^3 + y^6$

Pick the product that results in x^4y³: $9x^2 \times 2x^2y^3 = 18x^4y^3$.

All other combinations result in different powers of x and y.

Therefore The correct answer is 18.

Alternate Method

Given:

The expression is $(3x - 2y)^2(x^2 + y^3)^2$.

Formula Used:

Binomial expansion: $(a - b)^2 = a^2 - 2ab + b^2$ and $(a + b)^2 = a^2 + 2ab + b^2$.

Calculations:

=> Step 1: Expand the first part:

=> $(3x - 2y)^2 = (3x)^2 - 2(3x)(2y) + (2y)^2 = 9x^2 - 12xy + 4y^2$

=> Step 2: Expand the second part:

=> $(x^2 + y^3)^2 = (x^2)^2 + 2(x^2)(y^3) + (y^3)^2 = x^4 + 2x^2y^3 + y^6$

=> Step 3: Multiply the expansions to find the x^4y³ term:

=> Product = $(9x^2 - 12xy + 4y^2) \times (x^4 + 2x^2y^3 + y^6)$

=> Only the term $9x^2 \times 2x^2y^3$ yields $18x^4y^3$.

=> Other products like $-12xy \times 2x^2y^3 = -24x^3y^4$ and $4y^2 \times x^4 = 4x^4y^2$ do not match the required target power.

=> The coefficient is the numerical factor, which is 18.

Therefore The correct answer is 18.

Additional Information

Binomial Theorem

The general term in the expansion of $(a + b)^n$ is given by $T_{(r+1)} = {}^nC_r\, a^{(n-r)}b^r$.

Product of Polynomials

To find the coefficient of a specific term x^my^n, multiply terms from the first polynomial x^ay^b and second polynomial x^cy^d such that a+c = m and b+d = n.

Indices Rules

The rule $(x^a)^b = x^{(a \times b)}$ is essential for expanding terms like $(x^2)^2$ and $(y^3)^2$.

Q53. Answer: (b) IIT Dharwad

The correct answer is IIT Dharwad

Key Points

• IIT Dharwad launched the Global Center of Excellence in Affordable and Clean Energy (GCoE-ACE) in January 2022.
• The center aims to focus on research and development in the field of affordable and clean energy.
• It seeks to address the energy needs of underserved communities and contribute to sustainable development goals.
• The initiative is part of IIT Dharwad's commitment to innovation and excellence in energy solutions.

Additional Information

• IIT Dharwad is one of the newer IITs established by the Government of India to expand access to high-quality technical education.
• The institution focuses on fostering innovation, research, and collaboration across various fields of engineering and technology.
• The launch of the GCoE-ACE aligns with India's broader goals of promoting clean and sustainable energy solutions.
• The center will collaborate with various stakeholders, including government agencies, industry partners, and international organizations, to achieve its objectives.

Q54. Answer: (b) 925

The logic followed here is:

Hence, the correct answer is "925".

Q55. Answer: (b) 3

Shortcut Trick

The arithmetic mean acts as a balancing point, so the sum of net deviations is zero.

Deviations of x from the mean (4): (3 − 4) = −1, (5 − 4) = +1, (9 − 4) = +5, (2 − 4) = −2

Net deviation = ∑ f × (Deviation) = 0

=> 3(−1) + 4(+1) + p(+5) + 8(−2) = 0

=> −3 + 4 + 5p − 16 = 0 => 5p = 15 => p = 3

Therefore The correct answer is 3.

Alternate Method

Given:

Mean = 4

x = 3, 5, 9, 2

f = 3, 4, p, 8

Formula Used:

Mean = (∑ fx) ÷ (∑ f)

Mean = 4

x=2

f=8

dev: -2

x=3

f=3

dev: -1

x=5

f=4

dev: +1

x=9

f=p

dev: +5

Deviation Method: Balancing around Mean

∑ f × (x − Mean) = 0

Calculations:

=> ∑ f = 3 + 4 + p + 8 = 15 + p

=> ∑ fx = (3 × 3) + (5 × 4) + (9 × p) + (2 × 8)

=> ∑ fx = 9 + 20 + 9p + 16 = 45 + 9p

=> Mean = (45 + 9p) ÷ (15 + p)

=> 4 = (45 + 9p) ÷ (15 + p)

=> 4 × (15 + p) = 45 + 9p

=> 60 + 4p = 45 + 9p

=> 9p − 4p = 60 − 45

=> 5p = 15

=> p = 3

Therefore The correct answer is 3.

Additional Information

Arithmetic Mean

Mean is calculated as the sum of all observations divided by the total number of observations. For frequency distributions, Mean = ∑fx ÷ ∑f.

Net Deviation Property

The sum of deviations of all data points from their arithmetic mean is exactly zero: ∑ f × (x − Mean) = 0. This is the fastest way to solve missing value questions.

Empirical Relationship

For a moderately skewed distribution, the relationship between measures of central tendency is given by: Mode = 3 × Median − 2 × Mean.

Q56. Answer: (a) 15% gain

Shortcut Trick

Assume the total quantity of goods is 5 units and CP of each unit is 100.

Total CP = 5 × 100 = 500.

SP of 3 units at 25% gain = 3 × 125 = 375.

SP of remaining 2 units at CP = 2 × 100 = 200.

Total SP = 375 + 200 = 575.

Gain% = (575 − 500) ÷ 500 × 100 = 75 ÷ 5 = 15%.

Therefore The correct answer is 15% gain.

Alternate Method

Given: Fraction of goods sold at 25% gain = 3/5; Remaining fraction sold at 0% profit/loss = 2/5.

Formulas: Overall Gain% = (f1 × g1) + (f2 × g2)

=> Let the total goods be represented by 1.

=> Profit from first part = (3/5) × 25% = 15%.

=> Profit from remaining part = (2/5) × 0% = 0%.

=> Total gain percent = 15% + 0% = 15%.

Therefore The correct answer is 15% gain.

Additional Information

Weighted Average Profit

When parts of an inventory are sold at different profit rates, the total profit% is the sum of (part fraction × individual profit%).

Selling at Cost Price

Selling an item at its Cost Price (CP) means there is no profit and no loss, effectively representing 0% gain in the calculation.

Q57. Answer: (a) North - west

According to the given information,

1) Vishal is standing in a park facing the south direction.

2) He then turns 90° clockwise on the same point.

3) After that, he turns 45° clockwise.

Here, we can see that he is now facing North - west direction.

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

Q58. Answer: (c) EQRYR

The logic followed here is:

Given Sequence: QW _ R _ X E _ Q _ E R Q Z E _

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

Option 1) E, Q, R, E, R → Q W E R / Q X E R / Q E E R / Q Z E R

Option 2) E, Q, R, Y, E → Q W E R / Q X E R / Q Y E R / Q Z E E

Option 3) E, Q, R, Y, R → Q W E R / Q X E R / Q Y E R / Q Z E R

Here, the second alphabet is increasing by +1 to next pair.

Option 4) E, Q, Z, Y, R → Q W E R / Q X E Z / Q Y E R / Q Z E R

Here, 'EQRYR' followed a pattern.

Hence, the correct answer is "Option 3".

Q59. Answer: (a) 5%

The correct answer is 5%

Key Points

• The Central Government of India has reduced Agricultural Infrastructure Development Cess (AIDC) on Crude Palm Oil (CPO) from 7.5% to 5% with effect from 12th February 2022.

• This reduction aims to lower the cost of crude palm oil and benefit consumers by reducing the prices of edible oils.

• The AIDC is a tax levied on the import of certain goods to finance agricultural infrastructure and other development activities in India.

Additional Information

• The reduction in AIDC on CPO is expected to help in controlling the inflationary trends in the edible oil market.

• India is one of the largest importers of edible oils, and crude palm oil constitutes a significant portion of these imports.

• The government periodically reviews the cess and duties on imports to ensure the interests of both consumers and domestic producers are balanced.

• The AIDC was introduced in the Union Budget 2021-22 as a measure to boost agricultural infrastructure in the country.

Q60. Answer: (d) A, B and C

The correct answer is 4 Only.

Key PointsReflection Laws:

• The laws of reflection state that:

• The angle of incidence is equal to the angle of reflection.

• The incident ray, the reflected ray, and the normal to the surface all lie in the same plane.

• These laws apply to all types of mirrors, whether they are concave, convex, or plane.

• Concave Mirror: A concave mirror converges light and follows the laws of reflection.

• Convex Mirror: A convex mirror diverges light and also follows the laws of reflection.

• Plane Mirror: A plane mirror reflects light without converging or diverging it and adheres to the laws of reflection.

• Hence, the laws of reflection hold true for concave mirrors, convex mirrors, and plane mirrors. Hence, Option 4 is correct.

Q61. Answer: (b) Assam

The correct answer is 2) Assam

Key Points

• The 'Bordoisila' storm is a pre-monsoon phenomenon that occurs in the state of Assam.

• It is characterized by strong winds and heavy rainfall that typically occur in the months of March to May.

• The name 'Bordoisila' is derived from the Assamese words 'Bar' (wind) and 'Doi' (storm), reflecting its nature as a significant weather event in the region.

• These storms play a crucial role in the agricultural cycle of Assam, providing much-needed water for the crops before the onset of the monsoon.

Additional Information

• Assam, located in the northeastern part of India, is known for its rich culture, tea gardens, and biodiversity.

• The state experiences a tropical monsoon climate with heavy rainfall during the monsoon season, which is crucial for its agriculture-based economy.

• The Brahmaputra River, one of the major rivers in India, flows through Assam, significantly influencing its climate and agriculture.

Q62. Answer: (a) TCS : SDR

The logic followed here is:

STM : RUL

PJR : OKQ

Now, let's check each option,

1) TCS : SDR

=> Follows the logic.

2) VEW : UDV

3) BUP : AVQ

4) MTL : LUM

Hence, the correct answer is "TCS : SDR".

Q63. Answer: (c) 5, -3

Shortcut Trick

For equal roots, the Discriminant ($D = b^2 - 4ac$) must be zero.

Here, $(z + 1)^2 = 4 \times (z + 4) \times 1$.

Instead of solving the quadratic, test the given options:

If $z = 5$: $(5 + 1)^2 = 4(5 + 4) \Rightarrow 36 = 36$ (True).

If $z = -3$: $(-3 + 1)^2 = 4(-3 + 4) \Rightarrow 4 = 4$ (True).

Therefore The correct answer is 5, -3.

Alternate Method

Given: The quadratic equation is $(z + 4)x^2 + (z + 1)x + 1 = 0$.

Comparing with the standard form $ax^2 + bx + c = 0$:

$\Rightarrow a = (z + 4), b = (z + 1), c = 1$

Condition for equal roots: Discriminant (D) = 0

$\Rightarrow b^2 - 4ac = 0$

$\Rightarrow (z + 1)^2 - 4 \times (z + 4) \times 1 = 0$

$\Rightarrow z^2 + 2z + 1 - 4z - 16 = 0$

$\Rightarrow z^2 - 2z - 15 = 0$

$\Rightarrow z^2 - 5z + 3z - 15 = 0$

$\Rightarrow z(z - 5) + 3(z - 5) = 0$

$\Rightarrow (z - 5)(z + 3) = 0$

$\Rightarrow z = 5$ or $z = -3$

Therefore The correct answer is 5, -3.

Additional Information

Nature of Roots

For a quadratic equation, if $D > 0$, roots are real and distinct; if $D = 0$, roots are real and equal; if $D < 0$, roots are imaginary.

Quadratic Constraint

The leading coefficient a must not be zero. In this problem, $z + 4 \neq 0$, so $z \neq -4$.

Sum and Product

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

Q64. Answer: (a) It will reduce the release of CFCs that react with ozone molecules.

The correct answer is option 1

Key Points

• Option 1 is correct because it accurately states that reducing the release of chlorofluorocarbons (CFCs) will reduce the reaction of CFCs with ozone molecules, which is a primary cause of ozone depletion.

• CFCs are chemicals that, when released into the atmosphere, break down ozone molecules, leading to the thinning of the ozone layer.

• The ozone layer is crucial for protecting life on Earth from harmful ultraviolet (UV) radiation.

• By mandating the manufacturing of refrigerators that do not release CFCs, the international community aims to mitigate the damage to the ozone layer and promote environmental sustainability.

Additional Information

• The Montreal Protocol, an international treaty adopted in 1987, has been instrumental in reducing the production and consumption of ozone-depleting substances, including CFCs.

• Scientific studies have shown that the ozone layer is gradually recovering due to these global efforts.

• Alternative refrigerants, such as hydrofluorocarbons (HFCs), have been developed to replace CFCs, though some HFCs are also being phased out due to their global warming potential.

• Consumers can contribute to ozone layer protection by choosing products that are labeled as CFC-free.

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Q65. Answer: (c) Arun

According to the given information,

1) Suresh scored more than Priyanka but less than Arun.

Arun > Suresh > Priyanka

2) Dilan scored less than Rahul.

Rahul > Dilan

3) Arun scored more than Priyanka and Rahul.

Arun > Rahul > Dilan

4) Hiba scored the least.

Arun > Hiba

Here, we can see that Arun's mark is the highest amongst all six friends.

Hence, the correct answer is "Arun".

Q66. Answer: (b) 100 min

Shortcut Trick

Apply the Unitary Method directly.

Time for 21 oranges = 60 minutes.

Time for 35 oranges = (60 ÷ 21) × 35.

=> (20 ÷ 7) × 35 = 20 × 5 = 100 minutes.

Therefore The correct answer is 100 min.

Alternate Method

Given:

Number of oranges (O1) = 21, Time taken (T1) = 60 minutes.

Number of oranges (O2) = 35, Time taken (T2) = ?

Formula Used:

Since the pace is constant, the ratio of oranges to time is equal: O1/T1 = O2/T2.

Calculations:

=> 21 / 60 = 35 / T2

=> T2 = (35 × 60) ÷ 21

=> T2 = (35 ÷ 7) × (60 ÷ 3)

=> T2 = 5 × 20

=> T2 = 100 minutes.

Therefore The correct answer is 100 min.

Additional Information

Direct Proportion

When one quantity increases, the other increases in the same ratio. Formula: x1/y1 = x2/y2.

Time and Work Efficiency

Efficiency = Total Work ÷ Total Time. Here, the rate of eating represents the efficiency of Rachna.

Unitary Method

Finding the value of a single unit (time per orange) and then multiplying by the desired quantity.

Q67. Answer: (a) 3

The correct answer is 3

Key Points

• There are 3 tiers of administration in the Panchayati Raj Institutions in states with a population of more than 2 million.

• The three tiers are Gram Panchayat (village level), Panchayat Samiti (block level), and Zila Parishad (district level).

• This structure is designed to decentralize the administrative and governance processes to the grassroots level.

• The Panchayati Raj system was introduced through the 73rd Constitutional Amendment Act of 1992.

• This amendment added Part IX to the Constitution, titled "The Panchayats," and provided for a three-tier system of Panchayati Raj for all states having a population of over 2 million.

Additional Information

• The 73rd Amendment Act came into effect on 24th April 1993.

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• This amendment aimed at providing constitutional status to the Panchayati Raj institutions and ensuring their regular elections and financial autonomy.

• The Act mandates the establishment of a State Election Commission and a State Finance Commission to oversee the elections and financial matters of the Panchayats, respectively.

• The Panchayati Raj system is a significant step towards achieving decentralized governance and empowering local self-governments.

• The Gram Sabha, comprising all the adult members of a village, is a key component of the Panchayati Raj system, ensuring people's participation in local governance.

Q68. Answer: (a) 12 hours

Shortcut Trick

Net efficiency = Efficiency of A + Efficiency of B − Efficiency of C

Let Total Work (LCM of 15, 20, 30) = 60 units

Efficiencies: A = 4, B = 3, C = 2

Combined Efficiency = 4 + 3 − 2 = 5 units/hr

Time taken = 60 ÷ 5 = 12 hours

Therefore The correct answer is 12 hr.

Alternate Method

Given: Filling time of Pipe A = 15 hr, Pipe B = 20 hr, Emptying time of Pipe C = 30 hr.

Formula Used: Total Work = Time × Efficiency

Person	Days	Total Work	Efficiency
Pipe A	15	60	4
Pipe B	20	3	
Pipe C	30	−2	

=> Combined Efficiency of (A + B + C) = 4 + 3 + (−2)

=> Combined Efficiency = 5 units/hr

=> Time required to fill the tank = Total Work ÷ Combined Efficiency

=> Time = 60 ÷ 5 = 12 hours

Therefore The correct answer is 12 hr.

Additional Information

Pipes and Cisterns Logic

Filling pipes have positive efficiency, while emptying pipes (leakage) have negative efficiency.

Alternate Formula

Net work done in 1 hour = (1/x + 1/y − 1/z), where x and y are filling times and z is emptying time.

Q69. Answer: (b) cytoplasm

The correct answer is cytoplasm

Key Points

• Pyruvate is formed from glucose through the process of glycolysis.

• Glycolysis occurs in the cytoplasm of the cell.

• The cytoplasm is the part of the cell where various metabolic processes, including glycolysis, take place.

• During glycolysis, one molecule of glucose is broken down into two molecules of pyruvate, generating a net gain of ATP and NADH.

• Understanding the location and process of glycolysis is crucial for comprehending cellular respiration and energy production.

Additional Information

• Glycolysis is the first step in the breakdown of glucose to extract energy for cellular metabolism.

• It is an anaerobic process, meaning it does not require oxygen.

• The end products of glycolysis, pyruvate, can further enter the mitochondria to undergo aerobic respiration (Krebs cycle and electron transport chain) if oxygen is available.

• Alternatively, in the absence of oxygen, pyruvate can undergo fermentation to produce lactate in muscle cells or ethanol in yeast.

• The enzymes involved in glycolysis are highly conserved across different species, indicating the fundamental importance of this metabolic pathway.

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Q70. Answer: (d) Al < P < Si < S < Cl

The correct answer is option 4

Key Points

• Option 4 is the incorrect order for the number of valence shell electrons.

• Aluminum (Al) has 3 valence electrons.

• Phosphorus (P) has 5 valence electrons.

• Silicon (Si) has 4 valence electrons.

• Sulfur (S) has 6 valence electrons.

• Chlorine (Cl) has 7 valence electrons.

• The number of valence electrons for each element is as follows:

• Na (Sodium) - 1 valence electron

• Li (Lithium) - 1 valence electron

• B (Boron) - 3 valence electrons

• As per the periodic table, Sodium (Na) and Lithium (Li) belong to Group 1 with 1 valence electron each, whereas Boron (B) and Aluminum (Al) belong to Group 13 with 3 valence electrons each.

• Thus, the correct order should be Na = Li < B = Al in terms of the number of valence electrons.

Additional Information

• The periodic table arranges elements based on their atomic number, electron configurations, and recurring chemical properties.

• Elements in the same group (column) of the periodic table have similar properties and the same number of valence electrons.

• Valence electrons are the outermost electrons of an atom and are crucial in determining how the element reacts chemically.

Q71. Answer: (b) 28.12%

Given:

Production of cotton in 2017: 32 tons

Production of cotton in 2020: 41 tons

Concept:

Percentage increase in production is calculated by the formula:

Percentage Increase = (New Value - Old Value)/(Old Value) × 100%

Calculation:

=> Old Value = 32 tons

=> New Value = 41 tons

=> Percentage Increase = (41 - 32)/32 × 100%

=> Percentage Increase = 9/32 × 100%

=> Percentage Increase ≈ 28.125%

Therefore The approximate percentage increase in the production of cotton in 2020 as compared to 2017 is 28.125%.

Q72. Answer: (d) Cockroach

The correct answer is option 4

Key Points

• Cockroach is the organism among the given options that have spiracles.

• Spiracles are small openings on the surface of some animals that usually lead to respiratory systems.

• In cockroaches, spiracles are part of the tracheal system, which is used for respiration.

• These openings are found on the sides of the cockroach's body and allow air to enter the tracheal tubes, facilitating gas exchange.

Additional Information

• Earthworms breathe through their skin and do not have spiracles.

• Humans breathe through their lungs and do not have spiracles.

• Fish breathe through gills and do not have spiracles.

• Spiracles are a characteristic feature of certain arthropods, including insects like cockroaches.

Q73. Answer: (a) 2

Shortcut Trick

Put $\theta = 0°$ as the expression is valid for this value.

First term: (sin² 0° − sin^4 0° + 1) ÷ (1 − sin² 0°) => (0 − 0 + 1) ÷ (1 − 0) = 1 ÷ 1 = 1.
Second term: (1 − tan² 0° − tan^4 0°) ÷ (1 + tan² 0°) => (1 − 0 − 0) ÷ (1 + 0) = 1 ÷ 1 = 1.
Total value = 1 + 1 = 2.
Therefore The correct answer is 2.
Alternate Method
Given: (sin² θ - sin ^4 θ +1)/(1-sin² θ)+ (1-tan² θ - tan ^4 θ)/(1+tan² θ)
Formula Used: 1 − sin² θ = cos² θ and 1 + tan² θ = sec² θ
=> Term 1 = [sin² θ (1 − sin² θ) + 1] ÷ cos² θ
=> Term 1 = [sin² θ cos² θ + 1] ÷ cos² θ = sin² θ + sec² θ
=> Term 2 = [1 − tan² θ (1 + tan² θ)] ÷ sec² θ
=> Term 2 = [1 − tan² θ sec² θ] ÷ sec² θ = cos² θ − tan² θ
=> Expression = (sin² θ + sec² θ) + (cos² θ − tan² θ)
=> Expression = (sin² θ + cos² θ) + (sec² θ − tan² θ) = 1 + 1 = 2
Therefore The correct answer is 2.
Additional Information
Trigonometric Identities
Fundamental identities: sin² θ + cos² θ = 1, sec² θ − tan² θ = 1, and cosec² θ − cot² θ = 1.
Value Substitution Method
For identities independent of θ, substitute specific angles (like 0°, 45°, 90°) ensuring no denominator becomes zero.

Q74. Answer: (b) 42 years

Shortcut Trick
Present ratio (Father : Son) = 7 : 1 (Difference = 6)
Ratio after 3 years = 5 : 1 (Difference = 4)
Make difference equal: Multiply 1st ratio by 2 and 2nd ratio by 3.
New Ratios: Present = 14 : 2, After 3 yrs = 15 : 3. Increase of 1 unit = 3 years.
Present age of Father = 14 units = 14 × 3 = 42 years.
Therefore The correct answer is 42 years.
Alternate Method
Given: Present age ratio and age ratio after 3 years.
=> Let the present age of the son be x years.
=> Present age of the father = 7x years.
=> According to the question, after 3 years: (7x + 3) = 5 × (x + 3)
=> 7x + 3 = 5x + 15
=> 7x − 5x = 15 − 3
=> 2x = 12
=> x = 6
=> Present age of the father = 7 × 6 = 42 years.
Therefore The correct answer is 42 years.
Additional Information
Age Ratio Problems
The difference between the ages of two persons always remains constant regardless of the number of years passed.
Cross Multiplication Method
Used for finding initial values when ratios change after adding/subtracting a constant: (Initial Ratio) → (Final Ratio) after (+k).
Present to Future/Past
If present age is A, then age 'n' years ago was (A − n) and age 'n' years hence will be (A + n).

Q75. Answer: (b) R = 2uv/(u+v)

The correct answer is Option 2
Key Points
• The correct relation between radius of curvature 'R', object distance 'u' and image distance 'v' for a spherical mirror is given by R = (2uv)/(u+v).

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• This relation is derived from the mirror formula and the definition of the radius of curvature.
• The mirror formula for a spherical mirror is 1/f = 1/u + 1/v, where 'f' is the focal length of the mirror.
• Since the focal length 'f' is half of the radius of curvature 'R', we have R = 2f.
• By substituting 'f' in the mirror formula and rearranging the terms, we get R = (2uv)/(u+v).

Additional Information

• The mirror formula is applicable to both concave and convex mirrors.
• For concave mirrors, the focal length 'f' is considered negative, while for convex mirrors, it is positive.
• The object distance 'u' is always taken as negative in the sign convention used for spherical mirrors.
• The image distance 'v' can be positive or negative depending on the nature of the image (real or virtual).
• This formula is fundamental in optics and is used to solve various problems related to image formation by spherical mirrors.

Q76. Answer: (d) 1111

Shortcut Trick

The number 1234321 is a palindromic number representing the square of a number consisting only of digit 1.

Pattern: $11^2 = 121$, $111^2 = 12321$, $1111^2 = 1234321$.

The highest digit in the sequence is 4, so the square root must contain four ones.

Therefore The correct answer is 1111.

Alternate Method

Given: Number = 1234321

Method: Verification using digit count and pattern analysis.

=> Count of digits in 1234321 = 7

=> Square root of a 7-digit or 8-digit number always results in a 4-digit number.

=> Checking Option (4): 1111 × 1111

=> 1111 × 1 = 1111

=> 1111 × 10 = 11110

=> 1111 × 100 = 111100

=> 1111 × 1000 = 1111000

=> Total sum = 1111 + 11110 + 111100 + 1111000 = 1234321

Therefore The correct answer is 1111.

Additional Information

Square Pattern of 1s

For a number consisting of 'n' ones, the square is formed by writing numbers from 1 to 'n' and then back to 1. Example: $11111^2 = 123454321$.

Digit Count Rule

If a number has N digits, its square root has N/2 digits (if N is even) or (N+1)/2 digits (if N is odd).

Unit Digit Property

Since the unit digit of 1234321 is 1, its square root must end in either 1 or 9.

Q77. Answer: (c) oxidised

The correct answer is oxidised

Key Points

• If a substance loses hydrogen during a reaction, it is said to be oxidised.
• Oxidation is a process that involves the loss of electrons or an increase in oxidation state by a molecule, atom, or ion.
• In the context of hydrogen transfer, oxidation specifically refers to the loss of hydrogen atoms.
• Conversely, reduction refers to the gain of hydrogen atoms or the gain of electrons.
• Understanding the concepts of oxidation and reduction is fundamental in the study of redox reactions in chemistry.

Additional Information

• The terms oxidation and reduction originally referred to reactions involving the addition or removal of oxygen, respectively.
• These definitions have since been broadened to include the transfer of electrons and hydrogen atoms.
• Redox reactions are essential in various chemical processes, including metabolism, combustion, and corrosion.
• Oxidising agents are substances that can accept electrons, while reducing agents are substances that can donate electrons.

Q78. Answer: (b) Indus

The correct answer is Indus

Key Points

• The Nubra, Shyok, and Hunza are tributaries of the river Indus.

• The Indus River is one of the longest rivers in the world, flowing through China, India, and Pakistan.

• It plays a crucial role in the agriculture and economy of the regions it flows through, especially in Pakistan where it forms the backbone of the country's irrigation system.

• The river originates in the Tibetan Plateau near Lake Mansarovar and flows through the Ladakh region of India before entering Pakistan.

Additional Information

• The Indus River has a total length of approximately 3,180 kilometers (1,976 miles).

• It is one of the major rivers of the Indian subcontinent and has historical significance, being the cradle of the ancient Indus Valley Civilization.

• The river supports a diverse ecosystem and numerous species of fish and other aquatic life.

• The Indus Waters Treaty, signed between India and Pakistan in 1960, governs the distribution of the river's waters between the two countries.

Q79. Answer: (a) 355.085

Calculation:

We have,

156.025 + 251.216 - 52.156

=> 156.025 + 251.216 = 407.241

=> 407.241 - 52.156 = 355.085

Therefore The value of 156.025 + 251.216 - 52.156 is 355.085.

Hence, the correct answer is option 1.

Q80. Answer: (c) three

The correct answer is three

Key Points

• Three months should be devoted to skill training under the "Nai Manzil" Scheme.

• The "Nai Manzil" Scheme is an initiative by the Ministry of Minority Affairs aimed at providing non-residential integrated education and skill training to minority youth.

• The program duration ranges from 9 to 12 months, ensuring participants gain both educational and vocational skills.

• This scheme helps bridge the gap between education and employability for minority communities.

Additional Information

• The "Nai Manzil" Scheme focuses on enhancing the overall employability of minority youth by integrating academic education and skill training.

• The program also includes soft skills and personality development training to ensure holistic development.

• Participants are awarded certificates upon successful completion, which can aid in better employment opportunities.

• The Ministry of Minority Affairs continuously monitors the scheme to ensure its effectiveness and reach among the targeted beneficiaries.

Q81. Answer: (a) 3

The correct answer is 3 A

Key Points

• The total resistance (R_(total)) in a series circuit is the sum of all resistances: R_(total) = R1 + R2.

• Given R1 = 2 Ω and R2 = 3 Ω, therefore, R_(total) = 2 Ω + 3 Ω = 5 Ω.

• The current (I) in a series circuit is the same through all components and is given by Ohm's Law: I = V / R_(total).

• Given the battery voltage (V) is 15V, the current I = 15V / 5 Ω = 3A.

• Therefore, the current across R2 is 3 A.

Additional Information

• In a series circuit, the current is the same across all components, meaning the current flowing through R1 is the same as the current flowing through R2.

• Ohm's Law states that V = IR, where V is voltage, I is current, and R is resistance.

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• Series circuits are characterized by the fact that the total resistance is the sum of individual resistances, leading to a single current path.

• The voltage drop across each resistor in a series circuit can be calculated using V = IR for each resistor.

Q82. Answer: (c) Fundamental Rights

The correct answer is Fundamental Rights

Key Points

• Fundamental Rights in the Indian Constitution have been adopted from the Constitution of the United States.

• The Fundamental Rights are enshrined in Part III of the Indian Constitution, covering Articles 12 to 35.

• These rights include the right to equality, right to freedom, right against exploitation, right to freedom of religion, cultural and educational rights, and right to constitutional remedies.

• They are justiciable, meaning that individuals can seek enforcement of these rights through the judiciary if they are violated.

• The inclusion of Fundamental Rights aims to ensure the protection of individual liberties and the establishment of a constitutional order that upholds the dignity of individuals.

Additional Information

• The Constitution of India was adopted by the Constituent Assembly on 26th November 1949 and came into effect on 26th January 1950.

• It lays down the framework defining fundamental political principles, establishes the structure, procedures, powers, and duties of government institutions, and sets out fundamental rights, directive principles, and the duties of citizens.

• The Constitution of India is the longest written constitution of any country in the world.

• It declares India a sovereign, socialist, secular, and democratic republic, assuring its citizens justice, equality, and liberty, and endeavors to promote fraternity.

• The Fundamental Rights are inspired by the Bill of Rights in the United States Constitution.

• Amendments to the Constitution can be made through a process outlined in Article 368.

• The Fundamental Rights have been amended several times to meet the evolving needs of the nation.

Q83. Answer: (d) KC Neogy

The correct answer is KC Neogy

Key Points

• KC Neogy was the chairman of the First Finance Commission, which was constituted vide Presidential Order dated 22.11.1951.

• The Finance Commission is a constitutional body that is tasked with the distribution of financial resources between the central government and the states.

• The First Finance Commission played a crucial role in laying down the financial architecture of independent India.

• The Finance Commission is constituted every five years to recommend the distribution of taxes between the Union and the States and among the States themselves.

Additional Information

• The Finance Commission was established under Article 280 of the Indian Constitution.

• The recommendations made by the Finance Commission are advisory in nature and are implemented by the government as deemed appropriate.

• The Commission's role is vital in ensuring a balanced fiscal federalism in India.

• Over the years, the Finance Commission has evolved to address various financial challenges faced by the states and the central government.

• The current Finance Commission, as of 2023, is the Fifteenth Finance Commission, chaired by N. K. Singh.

Q84. Answer: (b) C7H12

The correct answer is Option 2

Key Points

• The next homologous series member of compound C6H10 is C7H12.

• In a homologous series, each successive member differs by a -CH2 unit.

• For the given compound C6H10, adding a -CH2 unit results in C7H12.

• The correct answer is therefore option 2, which is C7H12.

Additional Information

• A homologous series is a group of organic compounds that have a similar general formula, similar chemical properties, and show a gradation in physical properties.

• Members of a homologous series can be represented by a general formula, such as C_nH_(2n) for alkenes.

• Each member of the series differs from the next by a CH2 group (methylene group).

• Homologous series are important in predicting the properties and reactivity of organic compounds.

Q85. Answer: (a) 30.4

Shortcut Trick

Assume Mean (A) = 30.

Net Deviation (Σfd) = 5 × (10 − 30) + 5 × (20 − 30) + 4 × (30 − 30) + 6 × (40 − 30) + 5 × (50 − 30)

=> Σfd = 5 × (−20) + 5 × (−10) + 0 + 6 × 10 + 5 × 20 = −100 − 50 + 60 + 100 = 10.

Total frequency (Σf) = 5 + 5 + 4 + 6 + 5 = 25.

Arithmetic Mean = A + (Σfd / Σf) = 30 + (10 / 25) = 30 + 0.4 = 30.4.

Therefore The correct answer is 30.4.

Alternate Method

Given:

Values (x): 10, 20, 30, 40, 50

Frequencies (f): 5, 5, 4, 6, 5

Formula Used:

Arithmetic Mean (μ) = $\Sigma f_i x_i / \Sigma f_i$

Calculations:

=> Total Frequency (Σf) = 5 + 5 + 4 + 6 + 5 = 25

=> Sum of (f × x) = (10 × 5) + (20 × 5) + (30 × 4) + (40 × 6) + (50 × 5)

=> Σfx = 50 + 100 + 120 + 240 + 250

=> Σfx = 760

=> Arithmetic Mean = 760 ÷ 25

=> Arithmetic Mean = 30.4

Therefore The correct answer is 30.4.

Additional Information

Properties of Arithmetic Mean

The sum of deviations of a set of observations from their arithmetic mean is always zero, i.e., $\Sigma f_i(x_i - \mu) = 0$.

Empirical Relationship

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

Change of Origin and Scale

If each observation is increased by a constant k, the mean increases by k. If each observation is multiplied by k, the mean is also multiplied by k.

Q86. Answer: (b) 118, 24

The correct answer is Option 2

Key Points

• From a total of 118 elements, 24 elements were discovered through laboratory processes.

• The periodic table currently consists of 118 confirmed elements.

• Elements discovered through laboratory processes are typically synthetic and are created through nuclear reactions.

• These synthetic elements are usually found at the end of the periodic table, starting from Technetium (atomic number 43) to Oganesson (atomic number 118).

Additional Information

• The discovery of elements through laboratory processes has expanded our understanding of chemistry and nuclear physics.

• These synthetic elements often have very short half-lives, making them challenging to study.

• Understanding these elements helps scientists to explore the boundaries of the periodic table and the forces that hold atomic nuclei together.

• Many of these elements have practical applications in fields such as medicine, industry, and scientific research.

Q87. Answer: (b) E

According to the given information,

1) B is placed at second position from the top.

B

2) Only D is placed between A and B.

B
D
A

3) E is at one of the positions below D and there is only one box between E and D.

B
D
A
E

4) F is not at the bottom most position.

F
B
D
A
E
C

Here, we can see that E is placed at second position from the bottom.

Hence, the correct answer is "E".

Q88. Answer: (d) Rajasthan

The correct answer is Rajasthan

Key Points

• Rajasthan is the state where 'Khadins' are traditionally used for storing drinking water.

• Khadins are an ingenious water harvesting system found in arid and semi-arid regions, particularly in Rajasthan.

• The system involves constructing a long earthen embankment (called a bund) across the lower edge of a sloping farmland.

• During the monsoon, rainwater flows down the slope and is collected in the Khadin, where it percolates into the soil, making it fertile and suitable for agriculture.

• This traditional method helps in conserving water, which is crucial for regions facing water scarcity.

Additional Information

• Rajasthan is the largest state in India by area and is known for its desert landscape.

• Due to its arid climate, water conservation techniques like Khadins are vital for sustainable living.

• Other traditional water harvesting systems in Rajasthan include Johads, Baolis, and Tankas.

• The state has a rich cultural heritage and is famous for its forts, palaces, and vibrant festivals.

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• Efforts are being made to revive and promote traditional water conservation methods to address contemporary water issues.

Q89. Answer: (a) 1405

Shortcut Trick

The pattern follows the logic: (Previous Number × n) + n where n starts from 1.

9 × 1 + 1 = 10

10 × 2 + 2 = 22

22 × 3 + 3 = 69

69 × 4 + 4 = 280

280 × 5 + 5 = 1405

Therefore The correct answer is 1405.

Alternate Method

Given Series: 9, 10, 22, 69, 280, ?

9

×1+1

→

10

×2+2

→

22

×3+3

→

69

×4+4

→

280

×5+5

→

1405

The series is a Mixed Arithmetic Series where each term is multiplied by a consecutive integer and then added to the same integer.

=> 1^(st) term = 9

=> 2^(nd) term = 9 × 1 + 1 = 10

=> 3^(rd) term = 10 × 2 + 2 = 22

=> 4^(th) term = 22 × 3 + 3 = 69

=> 5^(th) term = 69 × 4 + 4 = 280

=> 6^(th) term = 280 × 5 + 5 = 1400 + 5 = 1405

Therefore The correct answer is 1405.

Additional Information

Multiplication Series

A series where numbers increase rapidly. Common patterns include (Previous Term × n) ± constant or (Previous Term × n) ± n.

Mixed Progression

These series involve more than one operation (e.g., multiplication followed by addition/subtraction) in a fixed sequence.

Identifying Patterns

Always check the rate of growth. If growth is exponential, look for multiplication or square/cube logic rather than simple differences.

Q90. Answer: (c) √2

The correct answer is √2.

Key Points

• Use Snell's law: n21 = (n2/n1) = sin i / sin r, where i is the angle of incidence and r is the angle of refraction.

• Substitute the given numerical values: i = 45°, r = 30°; hence n21 = sin 45° / sin 30°.

• Recall standard trigonometric values: sin 45° = √2/2, sin 30° = 1/2.

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• Compute the ratio: n21 = (√2/2) ÷ (1/2) = √2.

• The result n21 > 1 indicates the second medium is optically denser than the first medium, consistent with the ray bending toward the normal (r < i).

• This outcome aligns with the wave-speed relation: n = c/v; a larger refractive index implies a smaller speed of light in the second medium.

• In exam contexts, remember the quick check: if r < i, expect n2/n1 > 1; if r > i, expect < 1.

Additional Information

• Refractive index is a dimensionless number that describes how light propagates through a medium.

• It is defined as the ratio of the speed of light in vacuum to the speed of light in the medium.

• Higher refractive index indicates that light travels slower in the medium.

• Refractive indices are crucial in designing optical devices like lenses and prisms.

• They also play a significant role in understanding phenomena such as refraction, reflection, and dispersion of light.

• Materials with higher refractive indices bend light more than those with lower refractive indices.

• Refractive index can be influenced by factors such as wavelength of light and temperature of the medium.

Q91. Answer: (a) Rs. 3,244.80

Shortcut Trick

Net effective interest rate for 2 years at 4% compound interest = 4 + 4 + (4 × 4)/100 = 8.16%.

Total Amount to be returned = 100% (Principal) + 8.16% (Interest) = 108.16% of Principal.

Amount = 3000 × 108.16 / 100 = 30 × 108.16 = Rs. 3,244.80.

Therefore The correct answer is Rs. 3,244.80.

Alternate Method

Given:

Principal (P) = Rs. 3,000

Rate (R) = 4% p.a.

Time (n) = 2 years

Formula Used:

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

Calculations:

=> $A = 3000 \times (1 + 4/100)^2$

=> $A = 3000 \times (1 + 1/25)^2$

=> $A = 3000 \times (26/25) \times (26/25)$

=> $A = 3000 \times (676 / 625)$

=> $A = (3000 \div 625) \times 676$

=> $A = 4.8 \times 676$

=> A = Rs. 3,244.80

Therefore The correct answer is Rs. 3,244.80.

Additional Information

Compound Interest Formula

The interest earned is calculated on the initial principal and also on the accumulated interest of previous periods. CI = A − P.

Successive Percentage Change

For two successive changes of x% and y%, the effective change is given by [x + y + (xy/100)]%.

Compounding Periods

If interest is compounded half-yearly, the rate becomes R/2 and time becomes 2n. If quarterly, rate becomes R/4 and time becomes 4n.

Q92. Answer: (a) south pole to north pole

The correct answer is south pole to north pole

Key Points

• Magnetic field lines inside a bar magnet are directed from the south pole to the north pole.

• Outside the magnet, the field lines move from the north pole to the south pole, creating a closed-loop.

• This direction of field lines is consistent with the convention used to represent magnetic fields.

• Understanding the direction of magnetic field lines is crucial for analyzing the behavior of magnets and their interactions with

other magnetic materials.

• The field lines are denser at the poles of the magnet, indicating stronger magnetic fields in these regions.

Additional Information

• Magnetism is a property of materials that respond to an applied magnetic field.

• Materials like iron, cobalt, and nickel exhibit strong magnetic properties due to the alignment of their internal magnetic domains.

• A bar magnet is a permanent magnet with a north and south pole.

• Magnetic field lines are a visual tool used to represent the direction and strength of a magnetic field.

• They emerge from the north pole and enter the south pole outside the magnet, completing the loop through the magnet's interior.

Q93. Answer: (a) Both (a) and (b)

The correct answer is 1) Both (a) and (b).

Key Points

• Resistivity of a material is dependent on the nature of the material:

• This statement is correct because resistivity is an intrinsic property of a material and depends on the type of material.

• Resistivity of a material is independent of the area of cross section:

• This statement is correct because resistivity is a material property and does not change with the dimensions of the material, such as length or cross-sectional area.

• Resistivity of a pure metal is more than its alloy:

• This statement is incorrect. Generally, alloys tend to have higher resistivity compared to pure metals due to the presence of impurities which scatter electrons and increase resistance.

Q94. Answer: (d) 1/1.3

The correct answer is 1/1.3.

Key Points

• The relationship between the angle of incidence and angle of refraction follows Snell's Law: n1 * sin(x) = n2 * sin(y), where n1 and n2 are the refractive indices of air and water, respectively.

• The refractive index of air is n1 = 1, and for water, it is n2 = 1.3.

• By applying Snell's Law, the ratio sin(y) / sin(x) becomes n1 / n2 = 1 / 1.3.

• Therefore, the ratio of sin(y) / sin(x) is equal to 1/1.3.

• This ratio shows the relationship between the angles of refraction and incidence when light travels from air to water.

Additional Information

• Refraction occurs when light changes direction due to the difference in speed as it moves between different media.

• The refractive index is a fundamental property that determines how much light bends when entering a medium.

• When light moves from a less dense medium (air) to a denser medium (water), the light bends towards the normal, resulting in a smaller angle of refraction.

• Snell's Law provides a precise way to predict how light will refract given the refractive indices and angles of incidence and refraction.

• The refractive index of water typically ranges from 1.33 to 1.34, depending on the wavelength of light and environmental factors.

Q95. Answer: (c) Fertilisation of egg takes place in the uterus in human female

The correct answer is option 3

Key Points

• Seminal vesicle is a gland present in human males.

• In Amoeba, splitting of two cells takes place in any plane.

• Fertilisation of egg takes place in the fallopian tubes in human females, not in the uterus.

• Regeneration is not the same as reproduction.

Additional Information

• In human females, the process of fertilization typically occurs in the fallopian tubes. Once the egg is fertilized by a sperm, it travels down to the uterus where it implants and develops.

• The seminal vesicles are a pair of glands that are responsible for producing a significant portion of the fluid that makes up semen.

• Amoeba reproduces asexually through a process known as binary fission, where the cell divides into two equal parts.

• Regeneration refers to the process by which certain organisms can regrow lost or damaged parts of their body, which is different from reproduction, the process of producing new individuals.

Q96. Answer: (c) West

According to the given information,

1) Sujata is standing in a park facing the east direction.

2) She then turns 135° anticlockwise.

3) After that, she turns 90° anticlockwise.

4) Then, she turns 45° clockwise.

Here, we can see that she is now facing West direction.

Hence, the correct answer is "West".

Q97. Answer: (a) Sodium carbonate decahydrate

The correct answer is Sodium carbonate decahydrate

Key Points

• Sodium carbonate decahydrate is the chemical name of washing soda.

• It is a white crystalline solid and a common ingredient in many household cleaning products.

• Washing soda is used in laundry detergents to remove grease, oil, and stains from clothes.

• It also helps in softening water, making it more effective for cleaning purposes.

• Its chemical formula is $Na_2CO_3 \cdot 10H_2O$.

Additional Information

• Sodium carbonate (Na_2CO_3), also known as soda ash, is another form of the compound without water of crystallization.

• It is different from baking soda (sodium bicarbonate, $NaHCO_3$), which is commonly used in baking and as an antacid.

• Washing soda should be handled with care as it can be irritating to the skin and eyes.

• In addition to household cleaning, it is used in glass manufacturing, water treatment, and as a pH regulator in various industrial processes.

Q98. Answer: (b) 1096

Given:

Simplify $\sqrt{625} - \sqrt{324} + 33^2$

Concept:

To simplify the given expression, we need to use the following concepts:

1. Square root: The square root of a number x is a number y such that $y^2 = x$.

2. Squaring: The square of a number x is x multiplied by itself.

Calculation:

We have,

$\Rightarrow \sqrt{625} - \sqrt{324} + 33^2$

$\Rightarrow 25 - 18 + 1089$

$\Rightarrow 7 + 1089$

$\Rightarrow 1096$

Therefore The correct answer is option 2.

Q99. Answer: (b) 38

The number of fathers who are movie lovers but not engineers is shown below,

Hence, the correct answer is "38".

Q100. Answer: (d) One

Given number: '318924765'

After arranged in descending order:

Digits	**3**	**1**	**8**	**9**	**2**	**4**	**7**	**6**	**5**
Descending order	9	8	7	6	5	4	3	2	1

Comparing the positions,

Only the digit '4' remains in the same position (6th position).

Hence, the correct answer is "Option 4".

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