RRB Group D Previous Year Paper (Held on: 9 Sept 2022 Shift 3)

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

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CBT

Q1. Refer to the following number series and answer the question.

13 10 17 25 58 63 94 8 92 29

How many even numbers are immediately followed by a multiple of 3?

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

Q2. Which reaction is an example of a double displacement reaction?

(a) $Fe(s) + CuSO_4(aq) \rightarrow FeSO_4(aq) + Cu(s)$
(b) $Zn(s) + CuSO_4(aq) \rightarrow ZnSO_4(aq) + Cu(s)$
(c) $Na_2SO_4(aq) + BaCl_2(aq) \rightarrow BaSO_4(s) + 2NaCl(aq)$
(d) $Pb(s) + CuCl_2(aq) \rightarrow PbCl_2(aq) + Cu(s)$

Q3. The value of $5 + (12 - 3 \times 4) - 6 \div 2$ is :

(a) 6
(b) -2
(c) 2
(d) -6

Q4. Which formula is related to an unsaturated carbon compound?

(a) C_3H_8
(b) C_2H_6
(c) C_4H_{10}
(d) C_2H_4

Q5. International chess Olympiad 2022 is hosted by which of the following cities?

(a) Trivandrum
(b) Chennai
(c) Bengaluru
(d) Kolkata

Q6. A, K, G, D, H and Y are sitting in a straight row facing north. K is at one extreme end. Y is sitting third from the right of K and second to the left of A. D and H are immediate neighbours. G is sitting to the immediate left of A. D sits third to the left of G. Who is to the immediate right of K?

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

Q7. A, B and C can complete a piece of work in 20, 24 and 30 days, respectively. The number of days they take to finish it if they work together will be :

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

Q8. A number when increased by 471/2 %, gives 590. The number is :

(a) 400
(b) 500
(c) 600
(d) 700

Q9. Humans have been practicing water harvesting since ancient times. Some different forms of water harvesting structures are given in Column I and the place they are practiced in Column II. Select the option that shows the correct matching.

	Column I (Water harvesting structures)		**Column II (Places where they are practiced)**
A.	Surangams	i)	Bihar
B.	Pynes	ii)	Rajasthan
C.	Kulhs	iii)	Kerala
D.	Khadins	iv)	Himachal Pradesh

(a) (A) - (i), (B) - (ii), (C)- (iii), (D) - (iv)
(b) (A) - (iii), (B) - (i), (C)- (iv), (D) - (ii)
(c) (A) - (iii), (B) - (ii), (C)- (iv), (D) - (i)
(d) (A) - (ii), (B) - (iii), (C)- (i), (D) - (iv)

Q10. Select the option in which the numbers are related in the same way as are the numbers of the given sets.

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

E.g. 13 - Operations on 13 such as adding/deleting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)

(4, 13, 3)

(4, 19, 5)

(a) (6, 14, 2)
(b) (18, 28, 2)
(c) (1, 25, 8)
(d) (5, 30, 7)

Q11. How many such pairs of letters are there in the word REGULATION (in the forward direction) which have as many letters between them in the word as there are in the English alphabetical order?

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

Q12. The sum of two times Manavi's present age and Tanvi's present age is 35 years. Tanvi's father is presently three times as old as Tanvi. Manavi's brother's present age is 6 years more than Manavi's present age. The sum of the present ages of Tanvi's father and Manavi's brother is 56 years. What is the sum of the present ages (in years) of Manavi and Tanvi?

(a) 24
(b) 27

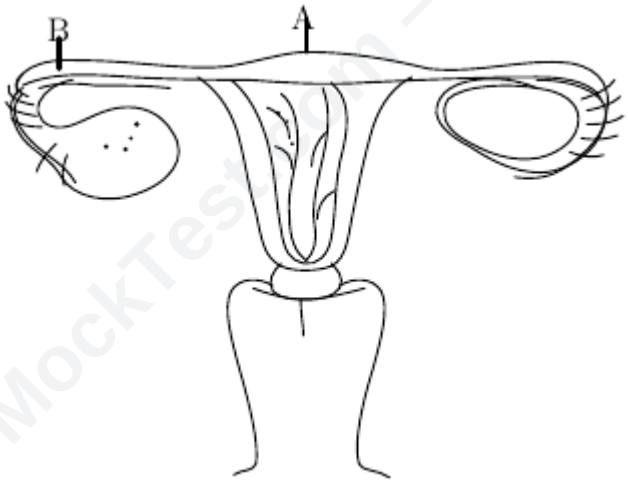
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(c) 23
(d) 31

Q13. Pole P is to the west of pole T and north of pole R. Pole Q is to the west of pole R and north of pole W. What is the position of pole R with respect to pole T?

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

Q14. The figure given below shows the sectional view of the human female reproductive system. Identify the option stating correct functions of the labelled parts A and B.

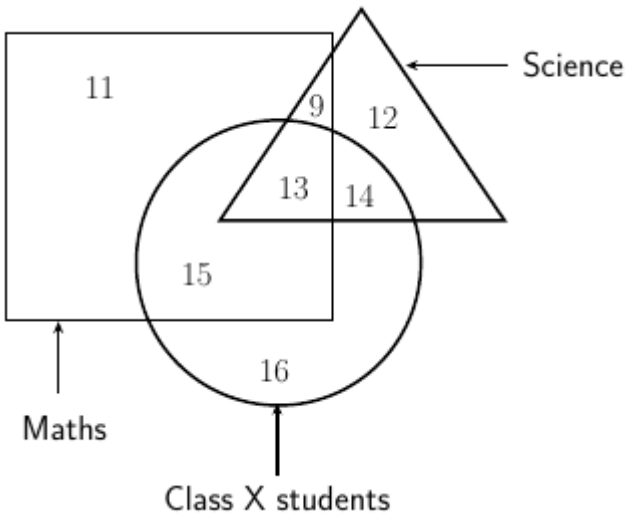


(a) A - Implantation and development of embryo, B - Fertilisation of egg
(b) Fertilisation of egg, B - Implantation and development of embryo
(c) A - Formation of egg, B - Fertilisation of egg
(d) A - Fertilisation of egg, B - Formation of egg

Q15. When blue and orange lights, which are parallel to each other, are passed through prism then :

(a) orange ray will bend more
(b) blue ray will bend more
(c) both emergent rays will be parallel
(d) blue ray will bend towards the top

Q16. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.



How many class X students like to study either Maths or Science but NOT both?

(a) 27
(b) 29
(c) 13
(d) 28

Q17. Select the number from among the given options that can replace the question mark (?) in the following series.

67, 67, 56, ?, 45, 45, 34, 34, 23, 23, 12

(a) 53
(b) 56
(c) 67
(d) 45

Q18. If the length of a conductor is increased five times, keeping material and thickness same, its resistance will

(a) become one-fifth of the original
(b) become five times of the original
(c) become double
(d) remain same

Q19. What is the altitude of the outermost range of the Himalayas, the Shiwaliks?

(a) 900 to 1100 meter
(b) 800 to 1000 meter
(c) 600 to 800 meter
(d) 700 to 900 meter

Q20. Refer the following letter, number, symbol series and answer the question.

(Left) H ^ 5 T & M 4 @ 5 # 1 4 J 3 P H 9 L ! 5 2 (Right)

If all numbers are dropped from the series, which of the following will be fifth from the right?

(a) P
(b) J
(c) @
(d) L

Q21. What was the fundamental property used by Mendeleev to arrange elements in his Periodic Table?

(a) Solid nature
(b) Atomic mass
(c) Liquid nature
(d) Gaseous nature

Q22. Given below is a statement followed by two possible conclusions I and II. Read the information carefully and select the correct option.

Statement :

The state government of state X has decided to move 40% of the city buses from the south of city A to the west of city A for the monsoon season.

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

I. The inflow of passengers in the western part of the city is usually substantially more during the monsoon season than the rest of the year.

II. The buses that remain in the south of city A will be sufficient to manage the general inflow of passengers.

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

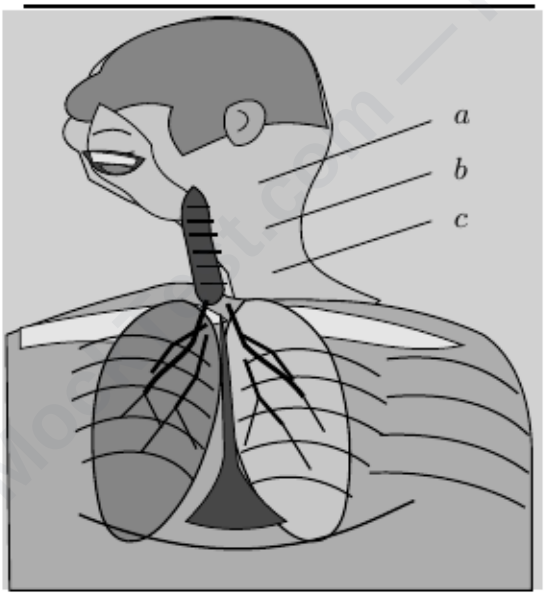
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Q23. Which of the following alphanumeric-clusters will replace the question mark (?) in the given series to make it logically complete?

P5U, N7U, L3O, J8R, ?

(a) H3E
(b) H2F
(c) H4D
(d) H2J

Q24. The labelling for the parts a, b and c of the human respiratory system shown below are given as options. Identify the correct option.



(a) a - Larynx, b - Pharynx, c - Trachea
(b) a - Pharynx, b - Trachea, c - Larynx
(c) a - Trachea, b - Larynx, c - Pharynx
(d) a - Pharynx, b - Larynx, c - Trachea

Q25. In a code language, 'you are my world' is written as 'kai po che lu', 'my home world' is written as 'je po kai', and 'she was my girl' is written as 'da mu kai va'. What is the code for the word 'world' in that language?

(a) mu
(b) po
(c) kai
(d) lu

Q26. The Third Five-Year Plan of India was launched under the leadership of.

(a) Lal Bahadur Shastri
(b) Jawaharlal Nehru
(c) Gulzarilal Nanda
(d) Morarji Desai

Q27. Using empirical relation between the mean, median and mode, find the value of the median if the mean is 35 and mode is 140.

(a) 90
(b) 80
(c) 100
(d) 70

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Q28. The Union Territory of Lakshadweep has inhabited islands as of March 2022.

(a) 16
(b) 14
(c) 10
(d) 12

Q29. In a class of 23 students Parul ranked 6^(th) from the top and Shomya ranked 19^(th) from the bottom. How many students ranked between Parul and Shomya?

(a) 0
(b) 2
(c) 1
(d) 12

Q30. In the year 2021, who among the following received the Shanti Swarup Bhatnagar Award in biological science?

(a) Aditi Sen De
(b) Amit Singh
(c) Jyotirmayee Dash
(d) Kayarat Sai Krishnan

Q31. The quadratic equation which has real and equal roots 3/5 is :

(a) $x^2 - 6x + 9 = 0$
(b) $5x^2 - 6x + 9 = 0$
(c) $25x^2 - 30x + 9 = 0$
(d) $x^2 - 30x + 3 = 0$

Q32. To obtain a virtual erect image by reflection from a concave mirror of focal length 20 cm, the object should be placed :

(a) at 20 cm
(b) between 20-40 cm
(c) between 0-20 cm
(d) at zero

Q33. Resistance of a conducting wire is 15 ohm. If another wire of the same material and length but having one-third radius is taken, then the resistance of the second wire will be.

(a) 135 ohm
(b) 45 ohm
(c) 60 ohm
(d) 5 ohm

Q34. As on April 2022, the Indian Constitution contains Articles, with 12 Schedules.

(a) 448
(b) 378
(c) 484
(d) 336

Q35. Three statements are followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they do not conform to real world knowledge, decide which of the given conclusions/possibilities can be true on the basis of the statements.

Statements :

1. Some biscuits are cookies.
2. Some cookies are pastries.
3. All pastries are creams.

Conclusions :

I. Some pastries are biscuits.

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II. Some creams are biscuits.

III. Some creams are cookies.

(a) Only conclusion I and II are true
(b) Only conclusion III is true
(c) Only conclusion II is true
(d) Only conclusion I is true

Q36. A strong magnet is moved towards a stationary coil. The induced current in the coil is the maximum when the angle between the direction of motion of the magnet and the plane of the coil is.

(a) 75°
(b) 90°
(c) 45°
(d) 15°

Q37. Poona Pact was between Mahatma Gandhi and.

(a) Lord Mountbatten
(b) Lord Irwin
(c) Sardar Vallabhbhai Patel
(d) Dr B.R. Ambedkar

Q38. Which of the following is NOT a location for the Kumbh Mela religious festival?

(a) Haridwar
(b) Allahabad
(c) Bodh Gaya
(d) Ujjain

Q39. Express 0.1overline7 in the form p/q, where p and q are integers and q ≠ 0.

(a) 7/45
(b) 5/49
(c) 6/49
(d) 8/45

Q40. According to the 2011 census of languages, which is the second highest spoken language in India?

(a) Telugu
(b) Bengali
(c) Gujarati
(d) Tamil

Q41. In March 2022, who was selected for the 31^(st) GD Birla Award for Outstanding Contribution and Scientific Research in the field of Physics?

(a) Professor Amrita Hazra
(b) Professor Pinaki Talukdar
(c) Professor Deepak Dhar
(d) Professor Narayan Pradhan

Q42. If the radius of a sphere is 5 cm, then its surface area is :

(a) 100 π cm^2
(b) 121 π cm2
(c) 144 π cm2
(d) 81 π cm2

Q43. Value of refractive index can be calculated by using :

(a) Ohm's law
(b) Newton's law
(c) Maxwell's law

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(d) Snell's law

Q44. Apart from nucleus of the cell, which two cell organelles have their own DNA and Ribosomes?

(a) Plastids and Mitochondria
(b) Plastids and Golgi bodies
(c) Mitochondria and Lysosomes
(d) Mitochondria and Golgi bodies

Q45. In a certain code language, 'SYMBOLIC' is written as 'CPTZNMJD' and 'SYMPATHY' is written as 'QBTZNUIZ'. How will 'SURVIVAL' be written in that language?

(a) TJWVSMBW
(b) WJTVSBWM
(c) WJTVSWBM
(d) WJTUSVBM

Q46. The quadratic equation whose roots are 2 and -1/2 is :

(a) $3x^2 - 3x - 2 = 0$
(b) $2x^2 - 3x - 2 = 0$
(c) $2x^2 - 5x - 2 = 0$
(d) $5x^2 - 3x - 2 = 0$

Q47. 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/subtracting/multiplying etc. to 13 can be performed. Breaking down 13 into 1 and 3 and then performing mathematical operations on 1 and 3 is not allowed)

(1, 2)

(5, 10)

(a) 7, 405
(b) 4, 8
(c) 3, 33
(d) 2, 10

Q48. A point on the principal axis which is at double the distance between P and F for a spherical mirror is :

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

Q49. The curved surface area of a cylinder is 1848 cm^2 and its base radius is 19.6 cm. The height of the cylinder is :

(a) 13 cm
(b) 15 cm
(c) 14 cm
(d) 17 cm

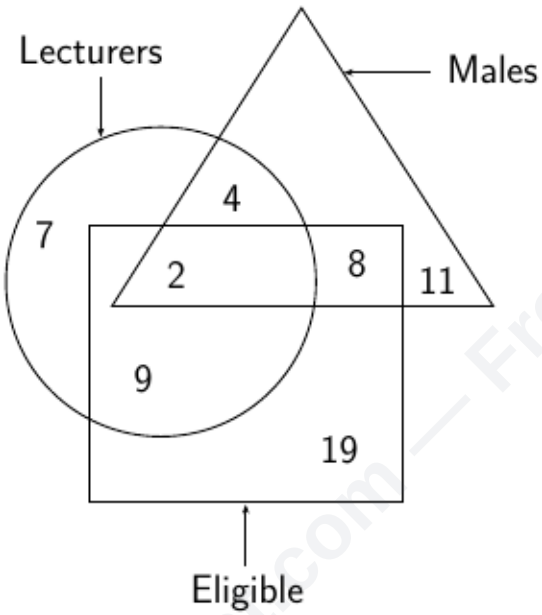
Q50. If '+' means '×', '×' means '÷', '÷' means '-', and '-' means '+', then what will be the value of the given expression?

999 - 3 + 10 × 5 ÷ 4

(a) 1000
(b) 550
(c) 3000
(d) 1001

Q51. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.

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How many such male lecturers are there who are NOT eligible?

(a) 6
(b) 4
(c) 10
(d) 2

Q52. In a cell, where does the process of breakdown of glucose, a 6-carbon molecule, to pyruvate, a 3-carbon molecule, take place?

(a) Mitochondria
(b) Cytoplasm
(c) Golgi apparatus
(d) Chloroplast

Q53. Six friends P, Q, R, M, N and O prepared together for a class test and each one scored different marks. Only 3 friends scored less marks than R. N scored less marks than only 1 friend. Only O scored marks between the marks of P and M. Who scored the highest marks?

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

Q54. Five boxes A, B, C, D, and E are kept one over the other but not necessarily in the same order. The box A is not kept above or below box C or E which are kept together. Box B is kept at the third place above box C. There is only one box between box D and E and one of them is kept at the bottom. Which box is kept in the middle?

(a) C
(b) A
(c) D
(d) B

Q55. Which air mass is warm?

(a) Continental Tropical
(b) Continental Polar
(c) Maritime Polar
(d) Continental Arctic

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Q56. If 3 is added to each odd digit and 1 is subtracted from each even digit in the number 4815421, what will be the sum of the digits that are third from the left and third from the right in the new number thus formed?

(a) 9
(b) 10
(c) 7
(d) 11

Q57. Seven people, A, B, C, D, E, F and G, are sitting in a straight row, facing north. Only three people sit between A and G. Only two people sit to the left of A. F is not an immediate neighbour of G. F sits second to the right of E. C sits to the immediate right of B. Who sits at the extreme left end of the row?

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

Q58. Who among the following became the Vice-President of India from 11th August 2022?

(a) B.D. Mishra
(b) Biswabhusan Harichandan
(c) Phagu Chauhan
(d) Jagdeep Dhankhar

Q59. The safety device that works on the heating effect of electric current is :

(a) Switch
(b) Fuse
(c) Heater
(d) Electric motor

Q60. A dishonest shopkeeper uses false weights. He gains 30% on purchasing and 30% on selling. His profit percentage is :

(a) 69%
(b) 99%
(c) 89%
(d) 79%

Q61. A team of 30 men is supposed to complete a work in 41 days. After 25 days, 6 more men are employed, and the work is finished one day earlier. By how many days would it have been delayed, if 6 more men were not employed?

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

Q62. Name the instrument used by the physicians to measure blood pressure.

(a) Sphygmomanometer
(b) Stethoscope
(c) Echocardiogram
(d) Spirometer

Q63. The elements having atomic numbers 15, 16, 17, and 18, respectively, are :

(a) Ar, Cl, S and P
(b) S, P, Cl and Ar
(c) P, S, Cl and Ar
(d) P, S, Ar and Cl

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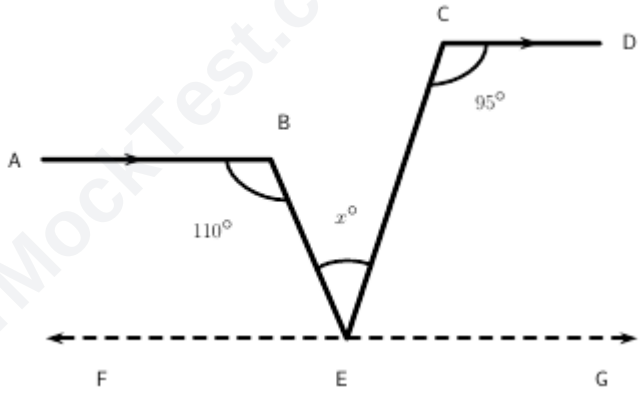
Q64. How many formula units of CaSO4 are attached to one molecule of water of crystallisation in Plaster of Paris?

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

Q65. The Revised PMJVK Scheme 2022-23, will now be implemented in all districts of the country including all the aspirational districts, States/UTs can propose infrastructure projects in the identified areas where the concentration of minority population is more than in the catchment area (5 km radius).

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

Q66. In the given figure, lines AB and CD are parallel to line FG. E is a point on the line FG. It is given that angle ABE = 110°, angle ECD = 95° and angle BEC = x°. The value of x is :



(a) 30°
(b) 25°
(c) 80°
(d) 60°

Q67. If (a + b) = 11 and (a - b) = 3 then, the value of ($a^2 + b^2$) is :

(a) 63
(b) 75
(c) 70
(d) 65

Q68. The Government of India set up a committee to review the Fiscal Responsibility and Budget Management Act 2003, under the Chairmanship of NK Singh, in the year.

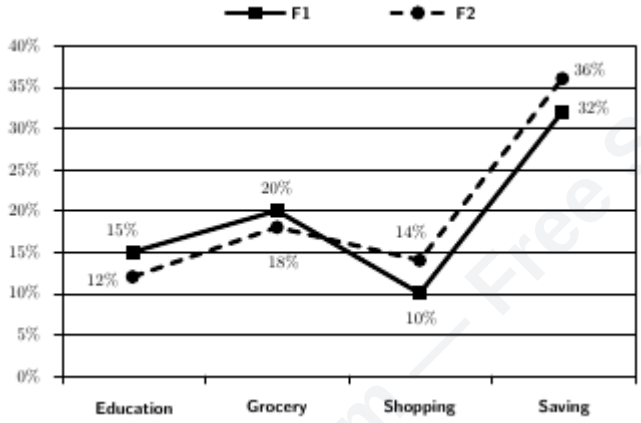
(a) 2013
(b) 2016
(c) 2015
(d) 2014

Q69. Raghav starts from Point A and drives 30 km towards the north. He then takes a right turn, drives 34 km, turns right and drives 41 km. He then takes a right turn and drives 47 km. He takes a final right turn, drives 11 km and stops at Point P. How far and towards which direction should he drive in order to reach Point A from Point P in a straight line? (All turns are 90 degree turns only)

(a) 13 km towards the east
(b) 15 km towards the west
(c) 23 km towards the east
(d) 13 km towards the south

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Q70. The given graph provides the details of expenses (in percentage) by two families (F1 and F2). Study the graph and answer the question.



Find the average percentage expense for grocery and shopping by family F 1.

(a) 31%
(b) 16%
(c) 33%
(d) 15%

Q71. Six persons, P, Q, R, S, T and U travelled in different months of the same year viz. January, February, March, July, September and December.

R travelled in September. Only one person travelled between R and T. No one travelled between U and P. P travelled in a month after U. More than two people travelled between P and S. Who among them travelled in July?

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

Q72. Which of the following numbers will replace the question mark (?) in the given series?

96, 98, 102, 110, 126, ?

(a) 162
(b) 158
(c) 166
(d) 160

Q73. In Δ PQR, if angle P : angle Q : angle R = 6 : 7 : 5 then, the measure of angle Q is :

(a) 55°
(b) 60°
(c) 70°
(d) 75°

Q74. is a government scheme meant for old age protection and social security of Unorganised workers.

(a) Atal Pension Yojna
(b) Life Cover under Pradhan Mantri Jan Dhan Yojana
(c) Pradhan Mantri Shram Yogi Maandhan Yojana
(d) Varishtha Pension Bima Yojana.

Q75. If $7 \sin^2 x + 3 \cos^2 x = 4$, and x is acute angle, then the value of cot x + tan x will be :

(a) $5/\sqrt{3}$
(b) $2/\sqrt{3}$
(c) $4/\sqrt{3}$
(d) $7/\sqrt{3}$

Q76. What is the form of contraception that can help stop the spread of sexually transmitted diseases to some extent?

(a) Oral contraceptive pills
(b) Vasectomy
(c) IUD
(d) Condoms

Q77. 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.

HTY : ZVK

KUY : ZWN

(a) APK : BRN
(b) KYT : WAL
(c) ABG : HCD
(d) AED : EGD

Q78. The value of $[(5^2)^4 \times 5^3] \div 5^9$ is :

(a) 125
(b) 5
(c) 1/5
(d) 25

Q79. What will be the value of the given expression if 4 and 7 are interchanged and also '×' and '÷' are interchanged?

63 × 3 - 4 + 18 ÷ 7

(a) 86
(b) 48
(c) 56
(d) 68

Q80. Each vowel in the word HAPPILY is changed to the letter following it in the English alphabetical order and each consonant is changed to the letter preceding it in the English alphabetical order. Which of the following letters will appear twice in the group of letters thus formed?

(a) K
(b) B
(c) O
(d) P

Q81. A man travels from point A to B at a speed of 561/4 km/h and returns to A through same route by increasing his speed by 331/3% of his earlier speed. His average speed (in km/h) for the whole journey is

(a) 621/4
(b) 605/7
(c) 631/2
(d) 642/7

Q82. If the 8-digit number 3 x 5479 y 4 is divisible by 88 and the 8-digit number 425139 z 2 is divisible by 9, then what is the greatest possible value of (3x + 2y - z)?

(a) 37
(b) 35
(c) 33
(d) 25

Q83. The highest common factor of any two distinct prime numbers is :

(a) 3
(b) 1
(c) 0
(d) 2

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Q84. The population of a village increases at the rate of 10% per annum. If its population 2 years ago was 10,000, the present population is :

(a) 12,000
(b) 12,400
(c) 12,100
(d) 11,000

Q85. Who stated that the principle of maximum social advantage is the most fundamental principle lying at the root of public finance?

(a) Arthur Cecil Pigou
(b) Martin EP Seligman
(c) Hugh Dalton
(d) John R Hicks

Q86. The expenditure of Sudha is 125% more than her savings. If her expenditure decreases by 6% and savings increase by 26.5%, then by what percent does her income increase?

(a) 20.5%
(b) 4%
(c) 8%
(d) 18.5%

Q87. In 1989, which committee recommended constitutional recognition for the local government bodies?

(a) AK Mathur Committee
(b) Vasudev Committee
(c) PK Thungon Committee
(d) Vaghul Committee

Q88. Study the given table and answer the question that follows.

The table presents the total number of new life policies (in thousands) sold by different bank branches over the years.

	2001	2002	2003	2004	2005
Branch A	53	34	54	54	76
Branch B	23	57	65	25	45
Branch C	54	54	56	76	34
Branch D	26	25	45	65	48
Branch E	64	76	76	92	90
Branch F	35	45	56	45	76
Branch G	62	52	45	65	45
Branch H	55	13	76	92	34

Which pair of branches have recorded lowest number of policy sales in these years taken together?

(a) Branch C and branch D
(b) Branch A and branch E
(c) Branch B and branch D
(d) Branch E and branch F

Q89. As stated by the law of variable proportions, as additional units of a variable factor are combined with a given level of fixed factors and technology, the marginal product of the variable factor.

(a) first increases and then declines
(b) declines sharply
(c) first declines and then increases

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(d) increases sharply

Q90. Na_2SO_4 (aq) + $BaCl_2$ (aq) → $BaSO_4$ (s) + 2NaCl (aq)

In the given reaction, which product remains in the solution?

(a) NaCl
(b) Na_2SO_4
(c) $BaSO_4$
(d) $BaCl_2$

Q91. Which Muslim festival is celebrated to mark the culmination of the hajj (pilgrimage) rites at Mina, Saudi Arabia, near Mecca?

(a) Eid Al-Adha
(b) Muharram
(c) Eid-Ul-Fitr
(d) Milad un-Nabi

Q92. Which of the following leads to global warming?

(a) Increase in CO_2 percentage in the air
(b) Afforestation
(c) Accumulation of plastic waste
(d) Increase in the levels of atmospheric ozone

Q93. A shopkeeper sells one battery for Rs. 650 at a profit of 30% and another battery for Rs. 950 at a loss of 5%. His overall gain or loss percentage is :

(a) 92/3% loss
(b) 62/3% gain
(c) 72/3% loss
(d) 82/3% gain

Q94. Which of the following molecules has only single bonds?

(a) O_2
(b) CH_4
(c) CO_2
(d) N_2

Q95. Six students, J, K, L, M, N and O, decided to race during a PE lesson. Each had a different speed in the race. N ran faster than M but slower than L. M ran slower than J but faster than O. K ran faster than L. J ran slower than L. Who among the six ran the fastest?

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

Q96. The sum of three consecutive natural numbers is 141. The middle number is :

(a) 57
(b) 47
(c) 56
(d) 46

Q97. Consider the below statements and identify the correct answer.

Statement - I : The stinging hair of nettle leaves injects methanoic acid causing burning pain.

Statement - II : Use of a mild base like baking soda on the stung area gives relief.

(a) Only Statement I is correct.
(b) Both statements are correct. Statement II is not related to Statement I.
(c) Both Statements are correct. Statement II is related to Statement I.

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(d) Only Statement II is correct.

Q98. Magnetic field lines around the current carrying circular loop are :

(a) perpendicular to conductor
(b) semi-circular
(c) parallel lines
(d) concentric circles

Q99. Which country has been declared as the winner of the 3^(rd) edition of the SAFF U-18 Women's Football Championship 2022?

(a) Bangladesh
(b) India
(c) Pakistan
(d) Nepal

Q100. The cost of 2 kg of apples and 2 kg of grapes on a day was found to be Rs. 160. After a month, the cost of 4 kg of apples and 3 kg of grapes was Rs. 300. Assuming the costs were not changed during the month, the cost of apples (per kg) will be :

(a) Rs. 60
(b) Rs. 20
(c) Rs. 40
(d) Rs.120

ANSWER KEY

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

SOLUTIONS

Q1. Answer: (a) 1

Given:

13 10 17 25 58 63 94 8 92 29

Let us check the even numbers in the given series:

Now, checking even numbers immediately followed by a multiple of 3

Here, 63 is a multiple of 3, and 94 is an even number.

94 is followed by 63 which is a multiple of 3.

Thus, only 63 is followed by an even number and 63 is a multiple of 3.

Hence, the correct answer is '1'.

Q2. Answer: (c) Na2SO4(aq) + BaCl2(aq) → BaSO4(s) + 2NaCl(aq)

The correct answer is 'Na2SO4(aq) + BaCl2(aq) → BaSO4(s) + 2NaCl(aq)'.

Key Points

• In a double displacement process, the positive and negative ions of two ionic compounds exchange positions to generate two new compounds.

• Covalent or ionic bonds may be present between the reacting species.

• The double displacement reactions often cause the precipitation of a single product.

• The general form of a double displacement reaction can be given as, AB + CD → AD + CB

Additional Information

• A chemical reaction in which one element in a compound is replaced by another is referred to as a single displacement reaction. This reaction is also referred to as a single replacement reaction or exchange reaction.

• The general form of a single displacement reaction can be given as, A + BC → AC + B.

• In a chemical reaction known as a neutralisation, an acid and a base combine to produce salt and water. The pH of the interacting acids and bases affects the pH of the salt that forms.

Q3. Answer: (c) 2

Given:

5 + (12 - 3 × 4) - 6 ÷ 2 = ?

Concept used:

BODMAS rule:

Calculation:

Now, using BODMAS rule

5 + (12 - 3 × 4) - 6 ÷ 2

5 + (12 - 12) - 6 ÷ 2

= 5 + 0 - 6 ÷ 2

= 5 + 0 - 3

= 5 - 3

= 2

Hence, the correct answer is "option 3".

Q4. Answer: (d) C2H4

The correct answer is 'C2 H4'.

Key Points

• Unsaturated hydrocarbons or unsaturated carbon compounds are covalent organic compounds having carbon and hydrogen atoms and made up of two nearby carbon atoms joined by a double or triple bond.

• Alkenes and alkynes are examples of unsaturated carbon molecules.

• Except for aromatic molecules, unsaturated hydrocarbons are mostly reactive and undergo many reactions to form multiple bonds.

• Compounds with just carbon-to-carbon single bonds are known as saturated hydrocarbons.

Additional Information

• A pure organic substance made up of only hydrogen and carbon is called a hydrocarbon.

• Typically colourless and hydrophobic, hydrocarbons have a light odour.

• Hydrocarbons are divided into three types: saturated hydrocarbons, unsaturated hydrocarbons, and aromatic hydrocarbons.

• Saturated hydrocarbons are the simplest type and they are totally made of single bonds and are hydrogen-saturated.

• Unsaturated hydrocarbons have one or more double or triple bonds between the carbon atoms.

• Aromatic hydrocarbons or arenes are hydrocarbons with at least one aromatic ring.

Q5. Answer: (b) Chennai

The correct answer is 'Chennai'.

Key Points

• This was the 44th Chess Olympiad, also known as the Indian Chess Olympiad.

• It was organized by the Fédération Internationale des Échecs (FIDE) in Chennai, the state capital of Tamil Nadu.

• It was held in India from 28 July to 10 August 2022 at Poonjeri village in Mamallapuram.

Additional Information

• The Olympiad was originally scheduled to take place in Russia but due to the ongoing Russian-Ukraine war, the International Chess Federation (FIDE) started looking for new bidders.

• India emerged as the topper among other countries and won the opportunity to host the high-profile event for the first time.

• The Union Government provided the hosting rights of the world's biggest chess event to Tamil Nadu.

Q6. Answer: (d) D

Given:

A, K, G, D, H, and Y are sitting in a straight row facing north.

Seating arrangement according to the given statements:

1. K is at one extreme end

2. Y is sitting third from the right of K.

In case 2 there is no space at right of K so case 2 will be eliminated here.

3. Y is sitting second to the left of A.

4. D and H are immediate neighbors.

There two possibilities when D and H can be immediate neighbors.

5. G is sitting to the immediate left of A.

6. D sits third to the left of G.

Therefore, case 1b gets eliminated here and the final arrangement is:

Thus, D is to the immediate right of K.

Hence, the correct answer is 'D'.

Q7. Answer: (a) 8 days

Shortcut Trick

Total Work = LCM(20, 24, 30) = 120 units

Efficiencies: A = 120/20 = 6, B = 120/24 = 5, C = 120/30 = 4

Combined Efficiency = 6 + 5 + 4 = 15 units/day

Required Time = 120 ÷ 15 = 8 days

Therefore The correct answer is 8 days.

Alternate Method

Given: Time taken by A = 20 days, B = 24 days, C = 30 days.

Formula Used: Total Work = LCM of individual days; Efficiency = Total Work ÷ Time Taken.

Person	Days	Total Work	Efficiency
A	20	120	6
B	24	5	
C	30	4	

=> Combined efficiency of A, B and C = 6 + 5 + 4 = 15 units/day

=> Total time taken together = Total Work ÷ Combined Efficiency

=> Time = 120 ÷ 15

=> Time = 8 days

Therefore The correct answer is 8 days.

Additional Information

Work and Efficiency Relationship

Efficiency is inversely proportional to the time taken to complete a work. If a person can finish a work in 'n' days, then their 1-day work is 1/n.

Pipes and Cisterns

Similar to Time & Work, but inlet pipes have positive efficiency and outlet (leakage) pipes have negative efficiency.

Work and Wages

Wages are always distributed in the ratio of the efficiency of the workers or the ratio of the work done by them.

Q8. Answer: (a) 400

Shortcut Trick

Convert percentage to fraction: 47(1/2)% = 95/200 = 19/40.

Let the original number be 40 units.

Increased value = 40 + 19 = 59 units.
Given 59 units = 590 => 1 unit = 10.
Original number = 40 × 10 = 400.
Therefore The correct answer is 400.
Alternate Method
Given:
Percentage increase = 47(1/2)% = 47.5%
Final value after increase = 590
Calculation:
Let the number be x.
=> x + 47.5% of x = 590
=> x(1 + 47.5/100) = 590
=> x(147.5/100) = 590
=> x = (590 × 100) / 147.5
=> x = (590 × 1000) / 1475
=> x = 590000 / 1475
=> x = 400
Therefore The correct answer is 400.
Additional Information
Percentage Increase Formula
New Value = Original Value × (100 + Increase %)/100.
Fractional Equivalents
To simplify calculations, remember 12.5% = 1/8, 37.5% = 3/8, and 47.5% = 19/40.
Base Value Concept
In percentage problems, the Original Number is always treated as 100% or 1 unit.

Q9. Answer: (b) (A) - (iii), (B) - (i), (C)- (iv), (D) - (ii)

The correct answer is '(A) - (iii), (B) - (i), (C)- (iv), (D) - (ii)'.
Key Points
• Surangams are used in Kerala, a system that provides a reliable supply of water for irrigation.
• The Pyne system is used in Bihar, it is an indigenous irrigation technology system used in South Bihar.
• Khadin is used in Rajasthan, based on the principle of rainwater harvesting on farmland.
• Kulhs is a traditional water harvesting system in Himachal Pradesh, the water flowing through the streams is diverted into manmade channels.

Q10. Answer: (c) (1, 25, 8)

The logic followed here is:
Now, checking the given options:
option 1: (6, 14, 2) =(14-6)/3=8/3 => 2 ≠ 8/3
option 2: (18, 28, 2) =(28-18)/3=10/3 => 2 ≠ 10/3
option 3: (1, 25, 8) =(25-1)/3=24/3 => 8 = 8
option 4: (5, 30, 7) =(30-5)/3=25/3 => 7 ≠ 25/3
Hence, the correct set of numbers is '(1, 25, 8)'.

Q11. Answer: (b) 2

Given:
REGULATION
Concept:
Explanation:
There are two such pairs in alphabetical order (GN) and (RU)
Hence, the correct answer is '2'.
Confusion PointsIt is given in the question that we have to check only in the forward direction
So, there are two such pairs in alphabetical order (GN) and (RU)

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ON and LI are not counted as these pairs are in reverse direction, which is prohibited in the question.

Q12. Answer: (a) 24

Shortcut Trick

Let Manavi's age be M and Tanvi's age be T.

Given: 2M + T = 35 and (3T) + (M + 6) = 56 => M + 3T = 50.

Adding equations: (2M + T) + (M + 3T) = 35 + 50 => 3M + 4T = 85.

Solving for T: Subtracting 2 × (M + 3T = 50) from 2M + T = 35 gives 5T = 65 => T = 13.

Substitute T = 13 in 2M + 13 = 35 => 2M = 22 => M = 11.

Sum of ages = 11 + 13 = 24 years.

Therefore The correct answer is 24 years.

Alternate Method

Given:

1. 2 × Manavi (M) + Tanvi (T) = 35
2. Father = 3T
3. Brother = M + 6
4. Father + Brother = 56

Calculations:

=> 3T + (M + 6) = 56

=> M + 3T = 50 — (Eq 2)

=> From Eq 1: T = 35 − 2M

=> Substitute T in Eq 2: M + 3(35 − 2M) = 50

=> M + 105 − 6M = 50

=> 5M = 55 => M = 11

=> T = 35 − 2(11) = 13

=> Sum = 11 + 13 = 24

Therefore The correct answer is 24 years.

Additional Information

Linear Equations in Two Variables

Problems involving two unknown ages are solved by forming two independent equations and using substitution or elimination methods.

Age Relation Constants

The difference between ages of two people always remains constant regardless of the number of years passed or future time.

Ratio Method

If ages are given in ratios for different time periods, use the cross-multiplication method to find the common multiplier directly.

Q13. Answer: (d) South-west

Given:

Four poles are given: PTRQ and W

Concept:

Directions conventions:

Explanation:

Diagram according to the given information:

• Pole P is to the west of pole T and north of pole R

•

• • Pole Q is to the west of pole R and north of pole W

•

• • position of pole R with respect to pole T

• Thus, the South-west is the position of pole R with respect to pole T

Hence, the correct answer is 'South-west'.

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Q14. Answer: (a) A - Implantation and development of embryo, B - Fertilisation of egg

The correct answer is A - Implantation and development of embryo, B - Fertilisation of egg.

Key Points

• Human fertilization is the joining of a human egg and sperm, which mainly takes place in the fallopian tube's ampulla.

• The outcome of this union results in the creation of a fertilized egg known as a zygote, which starts the embryonic development process.

• When a blastocyst develops into an embryo and attaches to the uterine wall, it has reached the stage of development known as implantation in mammals.

• When the first stage of gestation, implantation is successful, the female is regarded as pregnant.

• In the human uterus, the implantation location is often in the upper and posterior wall in the midsagittal plane.

Additional Information

• Humans reproduce sexually, in which the male and female gametes fertilise to create an embryo. Internal fertilisation, which occurs inside a female's body, is the process by which human embryos are fertilised.

• The formation and growth of the human embryo are known as human embryonic development or human embryogenesis.

• Human embryogenesis is distinguished by the embryo's early development phases of cell division and cellular differentiation.

• In a human, the first eight weeks of development after fertilisation are known as embryonic development, and at the start of the ninth week, the embryo is referred to as a foetus.

Q15. Answer: (b) blue ray will bend more

The correct answer is blue ray will bend more.

Key Points

• The splitting of white light into its individual colours is a process known as light dispersion.

• The spectrum is the collection of seven colours that results from the division of white light.

• While the velocities of the individual colours that make up white light are the same in a vacuum, they differ when the light travels through a transparent material like a glass prism.

• Different colours are deviated or bent at the prism's first face at various angles. Red has a minimum angle deviation due to maximum speed while violet has a maximum angle deviation due to minimum speed.

• When blue and orange lights, which are parallel to each other, are passed through a prism, then the blue ray will bend more because blue light has the least wavelength and minimum speed compared to orange light, so the angle deviation or bending will be more.

Additional Information

• When light rays encounter an obstruction like dust, gas molecules, water vapours, etc., they deviate from their straight-line path, and this phenomenon is known as the scattering of light.

• The "Tyndall effect" and the "red hues of sunrise and sunset" are just two examples of the phenomena caused by the scattering of light.

• With an increase in wavelength, the scattering of light gets less and less.

• The size of the scattering particles affects the colour of the light that is dispersed.

• The Tyndall effect is a phenomenon where light is scattered by colloidal particles.

Q16. Answer: (b) 29

The highlighted area represents "class X students like to study either Maths or Science but NOT both"

Number of class X students study only Science = 14

Number of class X students study only Maths = 15

Total class X students like only science and only maths = 14+15

= 29

Hence, the number of class X students who like to study either Maths or Science but NOT both is '29'.

Q17. Answer: (b) 56

Given:

67, 67, 56, ?, 45, 45, 34, 34, 23, 23, 12

Concept:

Every entity in the series repeats twice.

Explanation:

In the place of the question mark, 56 replaces that to complete the series.

Hence, the correct answer is '56'.

Q18. Answer: (b) become five times of the original

The correct answer is become five times of the original.

Key Points

• The obstruction to current flow in an electrical circuit is measured by resistance.

• The SI unit of resistance is ohms.

• The formula for resistance of a material is given as, R= ρ l/A, where ρ l, A, are the resistivity, length, and area of the cross-section of the material.

• When the length of the material is increased, the resistance will also be increased and when the area of the cross-section of the material is increased, the resistance will be reduced.

• If the length of a conductor is increased five times, keeping the material and thickness the same, its resistance will become five times of the original.

Additional Information

• Electrical resistivity is a fundamental feature of a material that quantifies how much it opposes the flow of electric current. Current flow is enhanced by lower resistivity.

• When a material's conductivity increases, its resistivity decreases and vice versa since resistivity is the reciprocal of conductivity.

• Temperature and resistivity are indirectly correlated. In other words, as a material's temperature rises, its resistivity will fall.

Q19. Answer: (a) 900 to 1100 meter

The correct answer is '900 to 1100 meter'.

Key Points

• Shiwalik Hills are the name of the Himalayan system's southernmost range.

• The Shiwalik Ranges' average elevation ranges from 900 to 1100 metres.

• There are several valleys in the region between the Shiwaliks and the lower Himalayas.

• These valleys, referred to as Duns, run almost parallel to the ranges.

Additional Information

• The sub-Himalayan range of the northern Indian subcontinent is known as the outer Himalayas, also spelt as Shiwalik or Siwalik.

• It extends from the Tisza River in Sikkim state across Nepal, northwest India, and into northern Pakistan for an additional 1,000 km in a west-northwesterly direction.

Q20. Answer: (b) J

Given:

(Left) H ^ 5 T & M 4 @ 5 # 1 4 J 3 P H 9 L ! 5 2 (Right)

Concept:

Drop all the numbers.

Explanation:

After dropping the numbers we get:

Fifth from the right is J.

Thus the correct answer is 'Option 2'.

Q21. Answer: (b) Atomic mass

The correct answer is 'Atomic mass'.

Key Points

• The elements in Mendeleev's periodic table were ordered according to their fundamental properties, atomic masses, and chemical characteristics.

• Only 63 elements were understood at the time of Mendeleev's work.

• Mendeleev discovered a periodic relationship between the element properties and atomic mass after researching the characteristics of each element.

• The pattern he noticed for the atoms that were not identified allowed him to forecast their atomic mass.

Additional Information

• Russian scientist Dmitri Ivanovich Mendeléev made the most significant contribution to the early creation of the periodic table.

• For the yet-to-be-discovered components, some gaps were left. Hence, if a new element is found, it can be added to a new group without upsetting any already existing groups.

• Mendeleev is most known for his development of the periodic table of elements and the periodic rule, which he adopted in 1869. In St. Petersburg, Russia, on February 2, 1907, he passed away.

Q22. Answer: (c) Both I and II can be concluded from the given information.

Statement:

The state government of state X has decided to move 40% of the city buses from the south of city A to the west of city A for the monsoon season.

Conclusion:

• I. The inflow of passengers in the western part of the city is usually substantially more during the monsoon season than the rest of the year.

• True- If the government moved 40% of buses, The demand must be increased in city A and the reason may be monsoon.

• II. The buses that remain in the south of city A will be sufficient to manage the general inflow of passengers.

• True- If the buses are decreased from city A then the remaining buses must be sufficient to manage the crowd in city A.

Thus, the correct answer is ' Both I and II can be concluded from the given information. '.

Q23. Answer: (d) H2J

Given:

P5U, N7U, L3O, J8R, ?

Concept used:

The logic followed here is:

P5U is written as:

N7U is written as:

L3O is written as:

J8R is written as:

Now check the given options :

Option 1 H3E

The concept does not hold here.

Option 2) H2F

The concept does not hold here.

Option 3) H4D

The concept does not hold here.

Option 4) H2J

The concept holds here.

Hence, 'H2J' is the alphanumeric-clusters that will replace the question mark (?) in the given series to make it logically complete.

Q24. Answer: (d) a - Pharynx, b - Larynx, c - Trachea

The correct answer is 'a - Pharynx, b - Larynx, c - Trachea '.

Key Points

• A network of tissues and organs called the respiratory system aids in breathing. Together with blood arteries, it also has airways and lungs.

• The respiratory system also includes the muscles that power the lungs.

• In Human respiratory system, there are many parts like Nose, Trachea, Larynx, Pharynx, wind pipe, Lungs, intrapulmonary bronchi, the bronchioles, and the alveolar ducts, etc.

Additional Information

• The airways can be categorised into two: the upper airway systems and the lower airway systems.

• The upper airway system comprises the nose and the paranasal cavities (or sinuses), the pharynx (or throat), and partly also the oral cavity, since it may be used for breathing.

• The larynx, the trachea, the stem bronchi, and all airways deeply ramifying inside the lungs make up the lower airway system.

Q25. Answer: (b) po

Given:

'you are my world' is written as 'kai po che lu'

'my home world' is written as 'je po kai'

'she was my girl' is written as 'da mu kai va'

Explanation:

From the first and second lines, we can conclude

my world is written as kai po.

And from the third line, we can conclude that my = kai

Hence,

world = po

Thus, the code for the word 'world' in that language is "po".

Q26. Answer: (b) Jawaharlal Nehru

The correct answer is 'Jawaharlal Nehru'.

Key Points

• Pandit Jawaharlal Nehru oversaw the 1961–1966 implementation of the third Five Year Plan.

• D. R. Gadgil served as the Planning Commission's deputy chairman throughout the third five-year plan's development. The Gadgil Yojana was another name for the programme.

• In April 1961, INDIA unveiled its Third Five-Year Plan for economic growth.

• The development effort started ten years ago is intended to be advanced by one level with this plan.

• Given the anticipated population expansion over the next 15 years, this economic planning aims to raise the income level of the Indian population by 100%.

Q27. Answer: (d) 70

Shortcut Trick

The Empirical Relationship is: Median = (Mode + 2 × Mean) ÷ 3

Substitute values: Median = (140 + 2 × 35) ÷ 3

Median = (140 + 70) ÷ 3 = 210 ÷ 3

Median = 70

Therefore The correct answer is 70.

Alternate Method

Given:

Mean = 35

Mode = 140

Formula used:

Mode = 3(Median) − 2(Mean)

Calculations:

=> 140 = 3 × (Median) − 2 × 35

=> 140 = 3 × (Median) − 70

=> 3 × (Median) = 140 + 70

=> 3 × (Median) = 210

=> Median = 210 ÷ 3

=> Median = 70

Therefore The correct answer is 70.

Additional Information

Empirical Relation for Skewed Distributions

For moderately asymmetrical distributions, Karl Pearson established: Mean − Mode = 3(Mean − Median).

Symmetrical Distribution

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

Positively vs Negatively Skewed

In a positively skewed distribution, Mean > Median > Mode. In a negatively skewed distribution, Mode > Median > Mean.

Q28. Answer: (c) 10

The correct answer is '10'.

Key Points

• A single-district Union Territory, Lakshadweep has an area of 32 square kilometres and consists of ten inhabited islands, 17 deserted islands connected by islets, four newly constructed islets, and one unoccupied island.

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• Kavaratti, Agatti, Amini, Kadmat, Kiltan, Chetlat, Bitra, Andrott, Kalpeni, and Minicoy are the inhabited islands.

• It is a single-district Union Territory that consists of ten populated islands, three reefs, and 12 atolls.

Q29. Answer: (a) 0

Given:

Total students = 23

Parul ranked 6th from the top

Shomya ranked 19th from the bottom.

Concept:

From the illustration we can see that no student is there between Shomya an Parul.

The correct answer is '0'.

Q30. Answer: (b) Amit Singh

The correct answer is ' Amit Singh'.

Key Points

• Dr. Amit Singh is an Associate Professor at the Indian Institute of Science (IISc), Bengaluru, where he teaches microbiology and cell biology.

• The award's goal is to honour excellent scientific and technological contributions made by Indians.

• Any Indian national conducting research in any field of science and technology who is under 45 years old as of December 31 of the year before the award year.

Q31. Answer: (c) $25x^2 - 30x + 9 = 0$

Shortcut Trick

If a quadratic equation has real and equal roots equal to k, it can be expressed directly as $(x - k)^2 = 0$.

Given the equal root k = 3/5, the equation is $(x - 3/5)^2 = 0$.

=> $(5x - 3)^2 = 0$

=> $(5x)^2 - 2(5x)(3) + 3^2 = 0$

=> $25x^2 - 30x + 9 = 0$

Therefore The correct answer is $25x^2 - 30x + 9 = 0$.

Alternate Method

Given: The roots of the quadratic equation are real and equal, with a value of 3/5.

Let the two roots be α = 3/5 and β = 3/5.

Formula Used: A quadratic equation with roots α and β is given by $x^2 - (\alpha + \beta)x + \alpha\beta = 0$.

=> Sum of roots (α + β) = 3/5 + 3/5 = 6/5

=> Product of roots (αβ) = (3/5) × (3/5) = 9/25

=> Substituting these values: $x^2 - (6/5)x + (9/25) = 0$

=> Multiply the entire equation by 25 to remove the denominator: $25(x^2) - 25(6/5)x + 25(9/25) = 0$

=> $25x^2 - 30x + 9 = 0$

Therefore The correct answer is $25x^2 - 30x + 9 = 0$.

Additional Information

Nature of Roots

For a quadratic equation $ax^2 + bx + c = 0$, the nature of roots is determined by the discriminant (D), where $D = b^2 - 4ac$. Roots are real and equal if D = 0.

Root Value for Equal Roots

When roots are equal (D = 0), the value of each root is given by the formula x = −b / 2a.

Perfect Square Trinomial

A quadratic equation with equal roots always represents a perfect square trinomial of the form $(px + q)^2 = 0$.

Q32. Answer: (c) between 0-20 cm

The correct answer is 'between 0-20 cm'.

Key Points

Concave mirror:

• If the reflection takes place from the inner surface of a spherical mirror, then the mirror is called a concave mirror.

• It is also known ahh

• Depending on the point of the object:

1. The image may be real or virtual.
2. Image may be erect or inverted.
3. image may be magnified or diminished.

• they are used widely, for example- Shaving mirrors, Doctor's head mirrors, ophthalmoscopes, Headlights, solar furnaces, etc.

Explanation:

The focal length of a concave mirror = 20 cm

The image formed by concave mirror = Virtual erect image

• The Virtual Image is formed when the object is placed between the principal focus and the pole.

• Also, Focal length is the distance between the pole and the principal focus.

• Here, The focal length is given as 20 Cm, so the most correct answer is from 0 cm to 20 cm.

Thus, the correct answer is 0-20cm.

Additional Information Here is the ray diagram formed by a concave mirror at different position:

Q33. Answer: (a) 135 ohm

Concept

Resistance of a conducting wire is given by: $R = (\rho l)/A$

where, R = resistance

ρ = resistivity

l = length

A = area

Calculation

Given, $l2 = l1$; $d2 = 3d1$

ρ = constant. ; $R1/R2 = l1/A1 \times A2/L2$; as, A prop. to d^2

$15/R2 = l1/(d1^2) \times (3d1^2)/l1$

$R2 = 15 \times 9$; $R2 = 135$ ohm

The correct answer is '135 ohm'.

Q34. Answer: (a) 448

The correct answer is '448'.

Key Points

• Originally the constitution contained 395 articles divided into 22 parts and 8 schedules. At present, there are 448 articles in 25 parts and 12 schedules.

• The number of articles has since increased to 448 due to 100 amendments.

• The numbering still remains the same but as and when the constitution is amended, new articles are added below original articles with suffixes A, B, C etc.

Additional Information

• This schedule was added by the 74th Amendment Act of 1992.

• There are 12 Schedules in the Indian Constitution.

• The Constitution has a preamble and 470 articles, which are grouped into 25 parts. With 12 schedules and five appendices, it has been amended 105 times; the latest amendment became effective on 15 August 2021.

Q35. Answer: (b) Only conclusion III is true

Given:

Statements :

1. Some biscuits are cookies.
2. Some cookies are pastries.
3. All pastries are creams.

Concept used:

Conclusions :

I. Some pastries are biscuits. False : No pastries in contained in biscuits.

II. Some creams are biscuits. False : No creams is contained in biscuits.

III. Some creams are cookies. True : Some part of creams are contained in cookies.

The correct answer is 'Only conclusion III is true'.

Q36. Answer: (b) 90°

The correct answer is ' 90° '.

Key Points

• Induced current be I,

• magnetic flux be O,

• B is the magnetic flux density,

• w be the angle between the direction of motion of the coil and the magnetic field,

• A is the area.

• Therefore, the induced current is proportional to the rate of change in magnetic flux.

Iproptodφ/dt

I = - AB sin ωt

As, sin w is maximum meansw = 90.

When the induced current in the coil is the maximum, the angle between the direction of motion of the magnet and the plane of the coil is 90.

Q37. Answer: (d) Dr B.R. Ambedkar

The correct answer is ' Dr. B.R. Ambedkar'.

Key Points

• In 1932, Mahatma Gandhi and Dr. B. R. Ambedkar came to an agreement on behalf of Dalits, lower caste Hindu leaders, and the depressed classes on the reservation of seats for the depressed classes in the assembly of British India.

• This agreement is known as the Poona Pact.

• Dalits (low-caste Hindu groups at the time commonly referred to as "untouchables") were granted additional rights by the Poona Pact, an agreement between Hindu leaders in India, on September 24, 1932.

• B.R. Ambedkar and Mahatma Gandhi negotiated the Poona Pact in 1932. The Communal Award of August 1932, which established a distinct electorate for oppressed classes, served as the impetus for the Poona Pact.

Q38. Answer: (c) Bodh Gaya

The correct answer is ' Bodh Gaya'.

Key Points

• Hinduism celebrates the Kumbh Mela, also known as Kumbha Mela, four times throughout the course of a 12-year period.

• The site of the observance rotates between four pilgrimage places on four sacred rivers—

1. At Haridwar on the Ganges River,

2. At Ujjain on the Shipra,

3. At Nashik on the Godavari, and

4. At Prayagraj at the confluence of the Ganges, the Jamuna, and the mythical Sarasvati.

• Bodh Gaya is not a location for the Kumbh Mela.

• Millions of pilgrims travel to Prayag to participate in the Kumbh Mela in particular.

Additional Information

• The philosopher Shankara, who organised frequent meetings of erudite ascetics for discussion and debate, is credited with creating the Kumbh Mela, according to tradition.

• Kumbh Mela is the Hindi term for the sign of Aquarius, and it is made up of the two words Kumbh and Mela. The immortal pot of nectar that the gods and devils battled over, as told in the Puranas (early Vedic texts), is where the word "Kumbh" originates.

Q39. Answer: (d) 8/45

Shortcut Trick

For a mixed recurring decimal like 0.ab, the fraction is (Total number − Non-repeating part) ÷ (9 for each repeating digit and 0 for each non-repeating digit).

Here, the decimal is 0.17.

Numerator = 17 − 1 = 16

Denominator = 90 (one 9 for the repeating '7' and one 0 for the non-repeating '1')

Fraction = 16 ÷ 90 = 8 ÷ 45

Therefore The correct answer is 8/45.

Alternate Method

Given: x = 0.1overline7

Formula Used: Algebraic manipulation to eliminate the bar (recurring) part.

=> x = 0.1777... (Equation 1)

=> Multiply by 10: 10x = 1.777... (Equation 2)

=> Multiply by 100: 100x = 17.777... (Equation 3)

=> Subtract Equation 2 from Equation 3: 100x − 10x = 17.777... − 1.777...

=> 90x = 16

=> x = 16 ÷ 90

=> x = 8 ÷ 45

Therefore The correct answer is 8/45.

Additional Information

Pure Recurring Decimal

A decimal where all digits after the decimal point repeat, like 0.333... = 3/9 = 1/3.

Mixed Recurring Decimal

A decimal where at least one digit after the decimal point is non-repeating, like 0.1222... = (12−1)/90 = 11/90.

Rational Number Property

Every terminating or recurring decimal can be expressed in the form p/q where q ≠ 0.

Q40. Answer: (b) Bengali

The correct answer is 'Bengali'.

Key Points

• According to 2011 census data, Bengali had 97 million speakers, which was second to Hindi's 528 million native speakers as the most common language in Indian homes.

• 43.63% of Indians, according to the 2011 census, are native Hindi speakers. Following Bengali, which has 8.03 percent of the population speaking it, are Marathi (6.86 percent), Telugu (6.7%), Tamil (5.7%), and Marathi (6.86%).

• According to the 2011 census, 43.63 percent of Indians identify Hindi as their mother tongue. With 8.03 percent of speakers, Bengali is second on the list. Marathi comes in third with 6.86 percent of speakers, behind Bengali.

Q41. Answer: (d) Professor Narayan Pradhan

The correct answer is 'Professor Narayan Pradhan'.

Key Points

• Professor Narayan Pradhan has been selected for the 31st GD Birla Award for Scientific Research 2022 for his outstanding contribution in the field of material sciences.

• This was announced by the K.K. Birla Foundation on 14 March 2022.

• The award is given to outstanding scientific research, mostly during the past 5 years, undertaken by an Indian scientist, who is below the age of 50, living and working in india.

Additional Information

• Ghanshyam Das Birla (10 April 1894 – 11 June 1983) was an Indian businessman and member of the Birla Family.

• The GD Birla Award for Scientific Research, which was established in 1991 to promote young scientists working in the field of research, should be acknowledged.

Q42. Answer: (a) 100 π cm²

Shortcut Trick

Surface Area of Sphere = $4\pi r^2$

Given radius (r) = 5 cm

Surface Area = $4 \times \pi \times (5)^2 = 4 \times \pi \times 25 = 100\pi$

Therefore The correct answer is 100π cm².

Alternate Method

Given:

Radius (r) of the sphere = 5 cm

Formula Used:

Surface Area of a sphere = $4\pi r^2$

Calculations:

=> Surface Area = 4 × π × (5 cm)²

=> Surface Area = 4 × π × 25 cm²

=> Surface Area = 100π cm²

Therefore The correct answer is 100π cm².

Additional Information

Volume of a Sphere

The total space occupied by a sphere is given by Volume = (4/3)πr³.

Hemisphere Properties

Curved Surface Area = 2πr² and Total Surface Area = 3πr².

Volume of a Hemisphere

The volume is exactly half of a full sphere: Volume = (2/3)πr³.

Q43. Answer: (d) Snell's law

The correct answer is 'Snell's law'.

Key Points

• Refraction: The bending of light or change in the direction of propagation of light as it moves from one medium to another medium is called refraction.

• Snell's law of refraction states that the ratio of the sine of the angle of incidence (i) to the sine of the angle of refraction (r) is constant for a light of a given wavelength travelling in a given pair of media.

• (sin i)/(sim r) = μ

• Here, μ is the refractive index of the second medium with respect to the first medium.

Additional Information

• According to Ohm's law, if the temperature and all other physical factors remain constant, the voltage across a conductor is directly proportional to the current that is flowing through it.

• Along with the Lorentz force law, Maxwell's equations, often known as the Maxwell-Heaviside equations, are a set of coupled partial differential equations that serve as the theoretical basis for classical electromagnetism, classical optics, and electric circuits. They explain how charges, currents, and field changes cause electric and magnetic fields to form.

• The relation between an object's motion and the forces acting on it is outlined by Newton's laws of motion, which are three fundamental principles of classical mechanics. They set the groundwork for classical mechanics by helping Newton examine and describe the motion of numerous physical objects and systems.

Q44. Answer: (a) Plastids and Mitochondria

The correct answer is 'Plastids and Mitochondria'.

Key Points

• Apart from the nucleus of the cell, the two cell organelles, Plastids and Mitochondria have their own DNA and Ribosomes

• They are able to synthesize some of their own protein and replicate independently of the nucleus.

• They are also known as autonomous organelles of cells.

• They are evolved from bacteria that were engulfed by nucleated ancestral cells, thus having their own genomes and their own biosynthetic machinery for making RNA and organelle proteins.

Additional Information

• In most eukaryotic species, mitochondria are double membrane-bound organelles and are referred to as the "powerhouse of the cell". They are located inside the cytoplasm and effectively serve as the cell's digestive system.

• The plastid is an organelle that is membrane-bound and is found in the cells of plants, algae, and certain other eukaryotic species,

• Most cells include an organelle called the Golgi apparatus, sometimes known as Golgi bodies. It performs a crucial function in the secretory process by encapsulating proteins into vesicles before secretion.

• Animal cells commonly contain lysosomes, which are membrane-bound organelles. These are globular vesicles that contain hydrolytic enzymes that can break down a wide range of biomolecules.

Q45. Answer: (c) WJTVSWBM

Given:

'SYMBOLIC' is written as 'CPTZNMJD'

'SYMPATHY' is written as 'QBTZNUIZ'

The pattern followed here is shown below:

1) 'SYMBOLIC' is written as 'CPTZNMJD'

2) 'SYMPATHY' is written as 'QBTZNUIZ'

Similarly,

3) SURVIVAL will be written as: ?

Hence, 'SURVIVAL' will be written in that language as 'WJTVSWBM'.

Q46. Answer: (b) $2x^2 - 3x - 2 = 0$

Shortcut Trick

Sum of the roots = 2 + (−1/2) = 3/2

Product of the roots = 2 × (−1/2) = −1

The Quadratic Equation is given by: x2 − (Sum)x + (Product) = 0

Substituting the values: x2 − (3/2)x − 1 = 0

Multiply the entire equation by 2 to eliminate the fraction: 2x2 − 3x − 2 = 0

Therefore The correct answer is 2x2 − 3x − 2 = 0.

Alternate Method

Given roots of the equation: α = 2 and β = −1/2

Formula Used: The standard form of a Quadratic Equation with roots α and β is x2 − (α + β)x + αβ = 0.

=> Step 1: Calculate the Sum of roots (α + β)

=> α + β = 2 + (−1/2) = 2 − 1/2 = 3/2

=> Step 2: Calculate the Product of roots (αβ)

=> αβ = 2 × (−1/2) = −1

=> Step 3: Substitute the Sum and Product into the Formula

=> x2 − (3/2)x + (−1) = 0

=> x2 − 3/2x − 1 = 0

=> 2x2 − 3x − 2 = 0

Therefore The correct answer is 2x2 − 3x − 2 = 0.

Additional Information

Relationship between Roots and Coefficients

For a Quadratic Equation ax2 + bx + c = 0, the sum of roots is −b/a and the product of roots is c/a.

Nature of Roots

The Discriminant (D) = b2 − 4ac determines the nature: if D > 0 roots are real and distinct, if D = 0 roots are real and equal, and if D < 0 roots are imaginary.

Factor Form

If α and β are roots, then (x − α) and (x − β) are factors of the quadratic expression, and the equation can be written as (x − α)(x − β) = 0.

Q47. Answer: (b) 4, 8

Given:

(1, 2)

(5, 10)

The logic followed here is:

Second number = First number × 2

Calculation:

(1, 2)

2 = 1 × 2

2 =2

And,

(5, 10)

10 = 5 × 2

10 = 10

Now, checking the given options

Option 1) (7, 405)

405 = 7 × 2

405 ≠ 14

Option 2) (4, 8)
8 = 4 × 2
8 = 8 (Logic is followed here.)
Option 3) (3, 33)
33 = 3 × 2
33 ≠ 6
Option 4) (2, 10)
10 = 2 × 2
10 ≠ 2
Hence, the correct answer is '(4, 8)'.

Q48. Answer: (d) centre of curvature

The correct answer is 'Centre of Curvature'.
Key Points
• A spherical mirror is part of a hollow sphere, whose one side is reflecting and the other side is opaque.
• There are two types of spherical mirrors present:
1. Concave mirror; Whose reflecting surface is towards the centre of the sphere of which the mirror is a part.
2. Convex mirror: Whose reflecting surface is away from the centre of the sphere of which the mirror is a part.
• A point on the principal axis which is at double the distance between P and F for a spherical mirror is the Centre of Curvature.

Q49. Answer: (b) 15 cm

Shortcut Trick
Direct formula for Curved Surface Area (CSA) of a cylinder: 2πrh
Given: CSA = 1848, r = 19.6
1848 = 2 × (22/7) × 19.6 × h
1848 = 44 × 2.8 × h => h = 1848 / 123.2 = 15
Therefore The correct answer is 15 cm.
Alternate Method
Given:
Curved Surface Area (CSA) = 1848 cm²
Base Radius (r) = 19.6 cm
Formula Used:
Curved Surface Area of a cylinder = 2 × π × r × h
Calculations:
=> 1848 = 2 × (22/7) × 19.6 × h
=> 1848 = 44 × (19.6 ÷ 7) × h
=> 1848 = 44 × 2.8 × h
=> 1848 = 123.2 × h
=> h = 1848 ÷ 123.2
=> h = 15 cm
Therefore The correct answer is 15 cm.
Additional Information
Total Surface Area (TSA) of Cylinder
The sum of the area of the curved surface and the two circular bases: TSA = 2πr(h + r).
Volume of Cylinder
The capacity of the cylinder calculated as: Volume = $\pi r^2 h$.
Hollow Cylinder
Volume of a hollow cylinder with outer radius R and inner radius r is $V = \pi h(R^2 - r^2)$.

Q50. Answer: (d) 1001

Given:
999 - 3 + 10 × 5 ÷ 4
The operators and their meaning is given:

Sign	•	×	÷	•
Means	×	÷	•	•

Concept:

BODMAS rule.

Calculation:

Substituting the symbols in given expression, we get,

999 + 3 × 10 ÷ 5 - 4

Applying BODMAS rule,

= 999 + 3 × 10 ÷ 5 - 4

= 999 + 3 × 2 - 4

= 999 + 6 - 4

= 1005 - 4

= 1001

Hence, the correct answer is '1001'.

Q51. Answer: (b) 4

The shaded portion represents males lectures which are not eligible.

Male lecturers which are not eligible are 4.

Hence the correct answer is 'Option 2'.

Q52. Answer: (b) Cytoplasm

The correct answer is 'Cytoplasm'.

Key Points

• Cytoplasm is the gelatinous liquid that fills the inside of a cell.

• It is composed of water, salts, and various organic molecules.

• Some intracellular organelles, such as the nucleus, and mitochondria, are enclosed by membranes that separate them from the cytoplasm.

• "Cyto" means "cell", "plasm" means "stuff", so it's "cell stuff".

Additional Information

• Mitochondria: They are membrane-bound cell organelles that generate most of the chemical energy needed to power the cell's biochemical reactions.

Chemical energy produced by the mitochondria is stored in a small molecule called adenosine triphosphate (ATP).

• Golgi apparatus: The Golgi apparatus, also called Golgi complex or Golgi body, is a membrane-bound organelle found in eukaryotic cells (cells with clearly defined nuclei) that is made up of a series of flattened stacked pouches called cisternae.

It is located in the cytoplasm next to the endoplasmic reticulum and near the cell nucleus.

• Chloroplast: Chloroplasts are the photosynthetic organelles of green algae and plants. Owing to their endosymbiotic origin, they contain their own genome with about 100 genes.

Q53. Answer: (d) Q

According to given information, we have the possible arrangements as follows:

1. Only 3 friends scored less marks than R.

_ > _ > R > _ > _ > ___

2. N scored less marks than only 1 friend.

_ > N > R > _ > _ > _

3. Only O scored marks between the marks of P and M.

___ > N > R > P > O > M

or

___ > N > R > M > O > P

4. Only one position is left which will be occupied by Q.

Q > N > R > P > O > M

or

Q > N > R > M > O > P

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Hence Q is at first position.

The correct answer is 'Q'.

Q54. Answer: (c) D

Given:

Five boxes A, B, C, D, and E are kept one over the other

Arranging the boxes according to the given information:

• The box A is not kept above or below box C or E which are kept together.

• We can conclude from here that C and D are together and from this information we can't decide the position of any of three alphabets (C D and A)

• Box B is kept at the third place above box C.

• As C and B are together, there are two possibiltes that B is third above C.

•

• • There is only one box between box D and E and one of them is kept at the bottom.

• Two possible positions are there for D

• • • Case 1 will be rejected as it is not possible.

• A will be placed after B and the first point also holds here that A is not above or Below C and E.

• We can conclude from the final arrangement that D is at middle.

Thus the correct answer id 'D'.

Q55. Answer: (a) Continental Tropical

The correct answer is 'Continental Tropical'.

Key Points

• Tropical air masses, designated by the letter 'T', are warm/hot as they originate over the lower latitudes of both land and sea.

• An air mass is a large volume of air in the atmosphere that is mostly uniform in temperature and moisture.

• Air masses can extend thousands of kilometers in any direction and can reach from ground level to the stratosphere—16 kilometers (10 miles) into the atmosphere.

Additional Information

• An air mass is a vast volume of air that has a consistent temperature and humidity.

• These masses can extend over thousands of miles horizontally across the Earth's surface and vertically from the ground level to the stratosphere, which is 10 miles high.

• Air masses originate from source regions that provide them with their uniform temperature and moisture.

• Due to low wind speeds, these large air volumes remain stationary over a particular region and acquire the region's temperature and humidity conditions.

• As wind speeds increase, they move to other areas while still retaining the characteristics of their source region.

Q56. Answer: (c) 7

Given:

4815421

Adding 3 to Odd digits and substracting 1 from even digits:

Adding third digit from right and third digit from left

Hence, the correct answer is '7'.

Q57. Answer: (c) D

Given:

• Seven people, A, B, C, D, E, F and G, are sitting in a straight row, facing north.

Solution:

1) Only three people sit between A and G.

2) Only two people sit to the left of A.

• Only case 1 qualify this condition because In case 2 more than two people are sitting on left of A.

3) F is not an immediate neighbour of G.

4) F sits second to the right of E.

5) C sits to the immediate right of B.

• they can sit only left G.

6) NOW, unoccupied position on leftmost where D can sit.

Hence, 'D' sits at the extreme left end of the row.

Q58. Answer: (d) Jagdeep Dhankhar

The correct answer is 'Jagdeep Dhankhar'.

Key Point

• Jagdeep Dhankhar became the fourteenth vice president on August 11, 2022.

• The term pro tempore (Latin: "for the time being") refers to the president and is derived from the Latin vice, which means "in place of." The vice president is sometimes referred to as the deputy president.

• The acronym VP is frequently used in ordinary conversation.

Additional Information

• The vice president is chosen indirectly by a secret ballot electoral college made up of representatives from both Houses of Congress who were both elected and nominated.

• The electoral college uses a proportional representation system with single transferable votes.

• First Vice-President refers to the Vice-President chosen by the Management Committee who, in addition to their other responsibilities, will assume the presidency in the event of the former's resignation.

Q59. Answer: (b) Fuse

The correct answer is 'Fuse'.

Key Points

• Fuse is based on the heating effect of current.

• The fuse breaks a circuit if a fault in an appliance causes too much current to flow.

• This protects the wire and the appliance if something goes wrong.

• The fuse contains a piece of wire that melts easily.

Additional Information

• Switch: An electric switch is a device that interrupts the electron flow in a circuit. Switches are primarily binary devices: either fully on or off and light switches have a simple design. When the switch is turned off, the circuit breaks and the power flow is interrupted.

• Heater: A heater is a device for supplying heat, It converts electric current into heat. for example a radiator or a convector. These water heaters heat water only when it is needed.

• Electric motor: An electric motor is an electrical machine that converts electrical energy into mechanical energy.

Q60. Answer: (a) 69%

Shortcut Trick

When a dishonest shopkeeper gains x% while purchasing and y% while selling, his overall profit percentage can be calculated using the successive percentage change formula.

Overall Profit% = a + b + (a × b) ÷ 100

Here, a = 30% and b = 30%.

Overall Profit% = 30 + 30 + (30 × 30) ÷ 100 = 60 + 9 = 69%.

Therefore The correct answer is 69%.

Alternate Method

Given:

Profit percentage while purchasing = 30%

Profit percentage while selling = 30%

Formula:

Overall Profit% = [(True Weight − False Weight) ÷ False Weight] × 100

Effective Multiplier = (1 + G1 ÷ 100) × (1 + G2 ÷ 100)

Steps:

=> Let the initial cost price be 100.

=> Profit during purchasing = 30%, which means he gets goods worth 130 for the price of 100.

=> Profit during selling = 30%, which means he sells the goods at 30% profit on the quantity he has.

=> Final Selling Price = 130 × (100 + 30) ÷ 100 = 130 × 1.3 = 169.

=> Net Profit% = [(169 − 100) ÷ 100] × 100 = 69%.

Therefore The correct answer is 69%.

Additional Information

Dishonest Dealer Concept

When a dealer cheats both during purchasing and selling using false weights, the overall gain is calculated successively: Effective Profit% = a + b + (a × b)/100.

Successive Percentage Formula

This formula is applicable whenever a quantity is increased successively by two percentage values, represented by Net Change% = x + y + xy/100.

Q61. Answer: (b) 2 days

Shortcut Trick

Since the work finished 1 day earlier than the 41-day schedule, it finished in 40 days.

The remaining work after 25 days was completed by 36 men in 15 days (40 − 25 = 15).

Total remaining work = 36 × 15 = 540 man-days.

If only the original 30 men worked, time taken for remaining work = 540 ÷ 30 = 18 days.

Initial scheduled time for the remaining work = 41 − 25 = 16 days.

Delay = Time taken by 30 men − Scheduled time = 18 − 16 = 2 days.

Therefore The correct answer is 2 days.

Alternate Method

Given:

Initial number of men = 30

Scheduled time to complete work = 41 days

Number of days worked by 30 men = 25 days

Extra men added after 25 days = 6

Formula Used:

Total Work = Number of Men × Number of Days

Calculation:

=> Actual time taken to finish the work = 41 − 1 = 40 days

=> Days worked by the new group of men = 40 − 25 = 15 days

=> Total men working in the last 15 days = 30 + 6 = 36 men

=> Remaining work completed by 36 men = 36 × 15 = 540 units

=> If no extra men were added, time taken by 30 men to complete 540 units = 540 ÷ 30 = 18 days

=> Total days taken if no extra men were added = 25 + 18 = 43 days

=> Delay = Total days taken − Scheduled days

=> Delay = 43 − 41 = 2 days

Therefore The correct answer is 2 days.

Additional Information

Chain Rule (MDH Concept)

For a group of men working, the relation between Men (M), Days (D), Hours (H) and Work (W) is given by: (M1 × D1 × H1) ÷ W1 = (M2 × D2 × H2) ÷ W2.

Efficiency & Time Relationship

The efficiency of a worker is inversely proportional to the time taken to complete the work. If efficiency ratio of A and B is x:y, their time taken ratio will be y:x.

Total Work Formula

Total work can be assumed as the LCM of the days taken by individuals, and it is calculated as Total Work = Efficiency × Time Taken.

Q62. Answer: (a) Sphygmomanometer

The correct answer is 'Sphygmomanometer'.

Key Points

• Sphygmomanometer, instrument for measuring blood pressure.

• It consists of an inflatable rubber cuff, which is wrapped around the upper arm and is connected to an apparatus that records pressure, usually in terms of the height of a column of mercury or on a dial (an aneroid manometer).

Additional Information

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• Stethoscope: It is an medical instrument used in listening to sounds produced within the body, chiefly in the heart or lungs.

• Echocardiogram: An echocardiogram, or "echo", is a scan used to look at the heart and nearby blood vessels. It's a type of ultrasound scan, which means a small probe is used to send out high-frequency sound waves that create echoes when they bounce off different parts of the body.

• Spirometer: A spirometer is a diagnostic device that measures the amount of air you're able to breathe in and out. It also tracks the time it takes you to exhale completely after you take a deep breath. A spirometry test requires you to breathe into a tube attached to a machine called a spirometer.

Q63. Answer: (c) P, S, Cl and Ar

The correct answer is 'P, S, Cl and Ar'.

Key Points

• P = Phosphorous, Atomic number= 15, Atomic mass = 30.973762 u.

• S = Sulfur, Atomic number = 16, Atomic mass = 32.065 u.

• Cl = Chlorine, Atomic number = 17, Atomic mass = 35.453 u.

• Ar = Argon, Atomic number = 18, Atomic mass = 39.948 u.

Aditional InformationModern periodic table:

Q64. Answer: (c) 2

The correct answer is '2'.

Key Points

• Plaster of Paris is calcium hemihydrate [CaSO4. 1/2 H2O]

• The formula actually means that two molecules (or two formula units) of CaSO4 share one molecule of water so that the effective water of crystallization for one CaSO4 unit comes to half a molecule of water.

• The formula of plaster of Paris can be written as 2CaSO4.H2O

• On heating,2(CaSO4 .2H2O) -----> 2CaSO4 .H2O + 3 H2O

Q65. Answer: (d) 25%

The correct answer is ' 25%'.

Key Points

• The revised PMJVK will be implemented in all districts of the country including all the Aspirational Districts.

• The projects under PMJVK will be proposed in any area where the concentration of the minority population is more than 25% in the catchment area (15 KM radius).

• The revised PMJVK has been approved by the Government for continuation over the 15th Finance Commission Cycle i.e., during FY 2021-22 to 2025-26.

• PMJVK will support the State/UTs in creating infrastructure to improve the quality of life of people and reduce the imbalances in the identified minority concentration areas to be at par with the rest of the country.

Additional Information

• The Cabinet Committee on Economic Affairs chaired by Prime Minister Narendra Modi on May 2, 2018, approved the proposal for renaming and restructuring of the Multi-sectoral Development Programme (MsDP) as Pradhan Mantri Jan Vikas Karyakram (PMJVK).

• The restructured program would provide better socio-economic infrastructure facilities to the minority communities, particularly in the field of education, health & skill development.

• The area to be covered under PMJVK would be 57% more as compared to the existing MsDP.

• The MsDP covered 196 districts of the country whereas PMJVK will cover 308 districts of the country.

Q66. Answer: (b) 25°

Shortcut Trick

For parallel lines AB || FG and CD || FG, the sum of consecutive interior angles is 180°.

angle BEF = 180° − 110° = 70°

angle CEG = 180° − 95° = 85°

Since FEG is a straight line, x = 180° − (70° + 85°) = 25°.

Therefore The correct answer is 25°.

Alternate Method

Given:

Lines AB || FG and CD || FG.

angle ABE = 110°, angle ECD = 95°, and angle BEC = x°.

Formula Used:

1. Sum of consecutive interior angles between parallel lines is 180°.

2. Sum of angles on a straight line is 180°.

Calculations:

Since AB || FG, the angles angle ABE and angle BEF are consecutive interior angles.

=> angle ABE + angle BEF = 180°

=> 110° + angle BEF = 180°

=> angle BEF = 180° − 110° = 70°

Similarly, since CD || FG, the angles angle ECD and angle CEG are consecutive interior angles.

=> angle ECD + angle CEG = 180°

=> 95° + angle CEG = 180°

=> angle CEG = 180° − 95° = 85°

Now, FEG is a straight line, so the sum of angles at point E is 180°.

=> angle BEF + angle BEC + angle CEG = 180°

=> 70° + x° + 85° = 180°

=> 155° + x° = 180°

=> x° = 180° − 155°

=> x° = 25°

Therefore The correct answer is 25°.

Additional Information

Parallel Lines and Transversals

When a transversal intersects two parallel lines, alternate interior angles are equal, and consecutive interior angles are supplementary (sum = 180°).

Linear Pair Axiom

If a ray stands on a line, then the sum of two adjacent angles so formed is 180°. This extends to any number of angles on one side of a straight line.

Transitivity of Parallelism

If two lines are parallel to the same line, then they are parallel to each other (If AB || FG and CD || FG, then AB || CD).

Q67. Answer: (d) 65

Shortcut Trick

Value of a = (Sum + Difference) ÷ 2 = (11 + 3) ÷ 2 = 7

Value of b = (Sum − Difference) ÷ 2 = (11 − 3) ÷ 2 = 4

Then, $a^2 + b^2 = 7^2 + 4^2$

=> 49 + 16 = 65

Therefore The correct answer is 65.

Alternate Method

Given:

a + b = 11

a − b = 3

Formula Used:

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

Calculation:

Substitute the given values into the algebraic formula:

=> $(11)^2 + (3)^2 = 2(a^2 + b^2)$

=> $121 + 9 = 2(a^2 + b^2)$

=> $130 = 2(a^2 + b^2)$

=> $a^2 + b^2 = 130 \div 2$

=> $a^2 + b^2 = 65$

Therefore The correct answer is 65.

Additional Information

Product Identity

The product of two variables can be easily found using the identity: $(a + b)^2 - (a - b)^2 = 4ab$.

Difference of Squares

The difference between the squares of two numbers is defined as: $a^2 - b^2 = (a + b)(a - b)$.

Sum and Difference of Cubes

For cube powers, use the identities: $a^3 + b^3 = (a + b)(a^2 - ab + b^2)$ and $a^3 - b^3 = (a - b)(a^2 + ab + b^2)$.

Q68. Answer: (b) 2016

The correct answer is ' 2016'.

Key Points

• In 2003 and 2016, the NK Singh Committee on FRBM Act was established to evaluate the FRBM Act.

• Nand Kishore Singh, a former revenue and expenditure secretary, served as the committee's chairman.

• Under N.K. Singh's leadership, the FRBM Review Committee was established in 2016 with the task of reviewing the Fiscal Responsibility & Budget Management (FRBM) Act.

• The FRBM Act was passed in 2003, and the government decided to examine it in 2016 because of the amount of time that had passed since it went into effect.

• The Indian economy, which had expanded and was now more favourable to foreign investment than it had been in 2003, had undergone significant changes since the act's enactment.

• Former RBI Governor Urjit Patel and former Finance Secretary Arvind Subramanian were among the committee's other members.

Q69. Answer: (a) 13 km towards the east

Given:

• Raghav starts from Point A and drives 30 km towards the north.

• He then takes a right turn, drives 34 km,

• turns right and drives 41 km.

• He then takes a right turn and drives 47 km.

• He takes a final right turn, drives 11 km and stops at Point P.

According to the given information, the figure is drawn below,

so, he drives in order to reach Point A from Point P in a straight line 13 km towards the east.

Hence, '13 km towards the east' is the correct answer.

Q70. Answer: (d) 15%

Given:

Expenses in	Family F1	Family F2
Education	15%	12%
Grocery	20%	20%
Shopping	10%	14%
Saving	32%	36%

Calculation:

The expenses of family F1

Expense on Grocery is 20%

Expense on Shopping is 10%

The average expenses of family F1 on Shopping and Grocery is = (Expenses on grocery + Expenses on shopping) ÷ 2

= (20% + 10%) ÷ 2

= 15%

Thus, the average percentage expense for grocery and shopping by family F 1 is '15%'.

Q71. Answer: (b) Q

Given:

Six persons, P, Q, R, S, T and U travelled in different months of the same year viz. January, February, March, July, September and December.

Scheduling as per the given information:

1) R travelled in September.

2) Only one person travelled between R and T.

3) No one travelled between U and P. P travelled in a month after U.

• This is possible only when U travelled in January.

4) More than two people travelled between P and S.

• This is possible only when S travelled in December.

5) the last person Q can travel only in July.

Thus, 'Q' among them travelled in July.

Hence, 'Option 2' is correct.

Q72. Answer: (b) 158

Given:

96, 98, 102, 110, 126, ?

The patttern followed here is,

Hence, '158' is the correct answer.

Q73. Answer: (c) 70°

Shortcut Trick

Sum of ratio parts = 6 + 7 + 5 = 18 units.

Total sum of angles in a triangle = 180°.

18 units = 180° => 1 unit = 10°.

Measure of angle Q = 7 units = 7 × 10° = 70°.

Therefore The correct answer is 70°.

Alternate Method

Given: Ratio of angles in Δ PQR is angle P : angle Q : angle R = 6 : 7 : 5.

Formula Used: Angle Sum Property of a triangle: angle P + angle Q + angle R = 180°.

Let the angles be 6x, 7x, and 5x.

=> 6x + 7x + 5x = 180°

=> 18x = 180°

=> x = 180° ÷ 18

=> x = 10°

=> angle Q = 7x = 7 × 10° = 70°

Therefore The correct answer is 70°.

Additional Information

Angle Sum Property

The sum of all interior angles of any triangle is always equal to 180°.

Types of Triangles by Angles

Q74. Answer: (c) Pradhan Mantri Shram Yogi Maandhan Yojana

The correct answer is 'Pradhan Mantri Shram Yogi Maandhan Yojana'.

Key Points

• The government of India has introduced a pension scheme for unorganized workers namely Pradhan Mantri Shram Yogi Maan-Dhan (PM-SYM) to ensure old age protection for Unorganized Workers.

• The Prime Minister, Shri Narendra Modi, on 5 March 2019, launched the Pradhan Mantri Shram Yogi Maandhan (PM-SYM) Yojana at Vastral in Gujarat.

• The Pradhan Mantri Shram Yogi Maandhan Yojana was introduced in the Interim Budget 2019-20 presented by the Union Minister for Finance, Corporate Affairs, Railways & Coal, Shri Piyush Goyal in Parliament on 1 February 2019.

• PM-SYM is meant for old age protection and social security of Unorganized Workers (UW) who are mostly engaged as rickshaw pullers, street vendors, mid-day meal workers, head, brick kiln workers, cobblers, rag pickers, domestic workers, washermen, home-based, agricultural workers, construction workers, beedi workers, handloom workers, leather workers, audio-visual workers or in similar other occupations.

• There are an estimated 42 crore such unorganized workers in the country. The entry age for the beneficiary is 18-40 years and he/she should not be a member of ESIC/EPFO or an income taxpayer.

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• The schemes are being implemented through the Life Insurance Corporation (LIC) of India and Common Service Centers. LIC is the Fund Manager and responsible for pension pay-out.

Q75. Answer: (c) 4/√3

Shortcut Trick

Rewrite the equation as: $4 \sin^2 x + 3(\sin^2 x + \cos^2 x) = 4$

Using $\sin^2 x + \cos^2 x = 1$, we get $4 \sin^2 x + 3 = 4 \rightarrow 4 \sin^2 x = 1$

$\sin^2 x = 1/4 \Rightarrow \sin x = 1/2$. For acute angle $x = 30°$.

$\cot 30° + \tan 30° = \sqrt{3} + 1/\sqrt{3} = (3 + 1)/\sqrt{3} = 4/\sqrt{3}$.

Therefore The correct answer is $4/\sqrt{3}$.

Alternate Method

Given: $7 \sin^2 x + 3 \cos^2 x = 4$

Formula Used: $\cos^2 x = 1 - \sin^2 x$

$\Rightarrow 7 \sin^2 x + 3(1 - \sin^2 x) = 4$

$\Rightarrow 7 \sin^2 x + 3 - 3 \sin^2 x = 4$

$\Rightarrow 4 \sin^2 x = 1$

$\Rightarrow \sin x = \sqrt{(1/4)} = 1/2$

=> Since $\sin 30° = 1/2$, $x = 30°$

=> Value = $\cot 30° + \tan 30°$

=> Value = $\sqrt{3} + 1/\sqrt{3}$

=> Value = $(3 + 1)/\sqrt{3} = 4/\sqrt{3}$

Therefore The correct answer is $4/\sqrt{3}$.

Additional Information

Trigonometric Identities

The fundamental identity is $\sin^2 x + \cos^2 x = 1$. Other forms include $1 + \tan^2 x = \sec^2 x$ and $1 + \cot^2 x = \text{cosec}^2 x$.

Relationship between Tan and Cot

cot x is the reciprocal of tan x, i.e., $\cot x = 1/\tan x$. Their sum can be expressed as $(\sin^2 x + \cos^2 x) / (\sin x \times \cos x) = 1 / (\sin x \times \cos x)$.

Specific Angle Values

For 30°: $\sin 30° = 1/2$, $\cos 30° = \sqrt{3}/2$, $\tan 30° = 1/\sqrt{3}$, $\cot 30° = \sqrt{3}$.

Q76. Answer: (d) Condoms

The correct answer is 'Condoms'.

Key Points

• When used correctly and consistently, they are a reliable method of preventing pregnancy and protecting both partners from STIs, including chlamydia, gonorrhoea and HIV.

Additional Information

• Oral Contraceptive pills: The pill prevents the ovaries from releasing an egg each month (ovulation). It also: thickens the mucus in the neck of the womb, so it is harder for sperm to penetrate the womb and reach an egg. thins the lining of the womb, so there is less chance of a fertilized egg implanting into the womb and being able to grow.

• Vasectomy: It is form ofmale birth control that cuts the supply of sperm to your semen. It's done by cutting and sealing the tubes that carry sperm. Vasectomy has a low risk of problems and can usually be performed in an outpatient setting under local anesthesia.

• IUD: IUD prevents pregnancy by not allowing the sperm to fertilize the egg. It may also make it harder for a fertilized egg to implant in the uterus.

Q77. Answer: (d) AED : EGD

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

The logic is followed here is,

Now applying the logic to all options.

Option 1:

Option 2:

Option 3:

Option 4:

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The logic applies only to option 4.

Hence, 'Option 4' is the correct answer.

Q78. Answer: (d) 25

Given:

[(52)4 × 53] ÷ 59

Concept used:

Indices law:

(a^m)^n= a^m^n

a^m ÷ a^n = a^(m - n)

am× an = am + n

Calculation:

[(52)4 × 53] ÷ 59

=> [(52)4 × 53] ÷ 59

=> [5^8× 53] ÷ 59

=> 5^{11}÷ 59

=> 5^((11 - 9))

=> 5^2

=> 25

Hence, the value of [(52)4 × 53] ÷ 59 is 25.

Q79. Answer: (a) 86

Decoding the information,

Original	**×**	**÷**	**4**
Changed	÷	•	7

Given:

63 × 3 - 4 + 18 ÷ 7 is the equation

Calculation:

Now, interchanging 4 and 7 and also after interchanging '×' and '÷' '×' and '÷' the equation becomes,

63 ÷ 3 - 7 + 18 × 4

Now, for solving use BODMAS rule

21 - 7 + 18 × 4

= 21 + 72 - 7

= 93 - 7

= 86

Hence, the correct answer is "Option 1".

Q80. Answer: (c) O

The logic that is followed here is:

Vowel + 1 = code

Consonant - 1 = code

Hence, O appeared twice after arranging.

Hence, the correct option is "O".

Q81. Answer: (d) 642/7

Shortcut Trick

Initial speed (V1) = 56.25 km/h. Return speed (V2) is increased by 33.33% (1/3rd).

V2 = 56.25 × (4/3) = 75 km/h.

Average Speed = (2 × V1 × V2) / (V1 + V2) = (2 × 56.25 × 75) / (56.25 + 75).

Average Speed = 8437.5 / 131.25 = 450/7 = 64(2/7) km/h.

Therefore The correct answer is 64(2/7) km/h.

Alternate Method

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Given: Initial speed = 56(1/4) km/h = 225/4 km/h. Speed increase = 33(1/3)% = 1/3.

Formula: Average Speed = Total Distance / Total Time = (2 × V1 × V2) / (V1 + V2)

=> Return speed V2 = (225/4) + (1/3 × 225/4) = (225/4) + (75/4) = 300/4 = 75 km/h.

=> Average Speed = [2 × (225/4) × 75] / [(225/4) + 75]

=> Average Speed = [2 × (225/4) × 75] / [(225 + 300)/4]

=> Average Speed = (2 × 225 × 75) / 525

=> Average Speed = (2 × 225) / 7 = 450/7

=> Average Speed = 64(2/7) km/h.

Therefore The correct answer is 64(2/7) km/h.

Additional Information

Average Speed (Equal Distances)

When a journey covers two equal distances at speeds x and y, the average speed is the harmonic mean: 2xy / (x + y).

Average Speed (General Case)

For any journey, Average Speed = Total Distance Traveled ÷ Total Time Taken.

Percentage to Fraction Conversion

Common conversions: 33(1/3)% = 1/3, 66(2/3)% = 2/3, 25% = 1/4, 12.5% = 1/8.

Q82. Answer: (c) 33

Shortcut Trick

Divisibility of 425139z2 by 9 => Sum of digits (26 + z) is divisible by 9 => z = 1.

Divisibility of 3x5479y4 by 8 => Last 3 digits (9y4) are divisible by 8 => y can be 0, 4, or 8.

Divisibility by 11 => Difference of odd/even position sums: (x + 17) − (y + 15) = x − y + 2 must be 0 or 11.

Testing y values gives valid (x, y) pairs: (9, 0), (2, 4), and (6, 8).

Evaluate 3x + 2y − z for each: 26, 13, and 33. The maximum value is 33.

Therefore The correct answer is 33.

Alternate Method

Given:

8-digit number 3x5479y4 is divisible by 88.

8-digit number 425139z2 is divisible by 9.

Concept Used:

Divisibility by 88 implies the number is divisible by both 8 and 11.

Divisibility by 8: The last 3 digits of the number must be divisible by 8.

Divisibility by 11: The difference between the sum of digits at odd places and the sum of digits at even places must be 0 or a multiple of 11.

Divisibility by 9: The sum of all digits must be divisible by 9.

Calculations:

Step 1: Find z using the divisibility rule of 9 for 425139z2.

=> Sum of digits = 4 + 2 + 5 + 1 + 3 + 9 + z + 2 = 26 + z

=> The nearest multiple of 9 greater than 26 is 27.

=> 26 + z = 27

=> z = 1

Step 2: Find y using the divisibility rule of 8 for 3x5479y4.

=> The last 3 digits 9y4 must be divisible by 8.

=> If y = 0, 904 ÷ 8 = 113 (Divisible)

=> If y = 4, 944 ÷ 8 = 118 (Divisible)

=> If y = 8, 984 ÷ 8 = 123 (Divisible)

=> Possible values for y are 0, 4, and 8.

Step 3: Find x using the divisibility rule of 11.

=> Sum of digits at odd places (from the left) = 3 + 5 + 7 + y = y + 15

=> Sum of digits at even places (from the left) = x + 4 + 9 + 4 = x + 17

=> Difference = (x + 17) − (y + 15) = x − y + 2

=> For divisibility by 11, (x − y + 2) must be 0 or 11.

Checking possible pairs for (x, y):

=> Case 1: If y = 0, x − 0 + 2 = 11 => x = 9

=> Case 2: If y = 4, x − 4 + 2 = 0 => x = 2

=> Case 3: If y = 8, x − 8 + 2 = 0 => x = 6

Step 4: Find the greatest possible value of (3x + 2y − z).

=> For x = 9, y = 0, z = 1 => 3(9) + 2(0) − 1 = 27 + 0 − 1 = 26

=> For x = 2, y = 4, z = 1 => 3(2) + 2(4) − 1 = 6 + 8 − 1 = 13

=> For x = 6, y = 8, z = 1 => 3(6) + 2(8) − 1 = 18 + 16 − 1 = 33

=> The greatest possible value obtained is 33.

Therefore The correct answer is 33.

Additional Information

Divisibility Rule of 8

A number is divisible by 8 if the number formed by its last three digits is a multiple of 8.

Divisibility Rule of 9

A number is divisible by 9 if the total sum of all its digits is completely divisible by 9.

Divisibility Rule of 11

A number is divisible by 11 if the difference between the sum of digits at odd positions and even positions is either 0 or a multiple of 11.

Divisibility of Composite Numbers

To check divisibility for a composite number like 88, simply verify divisibility for its co-prime factors, which are 8 and 11.

Q83. Answer: (b) 1

Shortcut Trick

Prime numbers have only two factors: 1 and the number itself.

For any two distinct prime numbers, the only common factor they share is 1.

By definition, the Highest Common Factor (HCF) of such numbers is always 1.

Therefore The correct answer is 1.

Alternate Method

Given: Two distinct prime numbers (let them be p1 and p2).

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

=> Let the numbers be 3 and 5.

=> Factors of 3 = {1, 3}

=> Factors of 5 = {1, 5}

=> Common Factors = {1}

=> HCF (Highest Common Factor) = 1

Therefore The correct answer is 1.

Additional Information

Co-prime Numbers

Any two numbers whose HCF is 1 are called co-prime numbers. All distinct prime numbers are inherently co-prime.

LCM of Prime Numbers

The Least Common Multiple (LCM) of any two distinct prime numbers is always their product (p1 × p2).

Smallest Prime Number

2 is the only even prime number and is the smallest prime number in the number system.

Q84. Answer: (c) 12,100

Shortcut Trick

Using Successive Percentage method for 2 years at 10% per annum.

Net Percentage Increase = x + y + (x × y)/100 = 10 + 10 + (10 × 10)/100 = 21%.

Present Population = 10,000 + 21% of 10,000 = 10,000 + 2,100 = 12,100.

Therefore The correct answer is 12,100.

Alternate Method

Given:

Initial Population (2 years ago) = 10,000

Rate of Increase (R) = 10% per annum

Time Period (n) = 2 years

Formula Used:

Present Population = $P \times (1 + R/100)^n$

Calculations:

=> Present Population = $10,000 \times (1 + 10/100)^2$

=> Present Population = $10,000 \times (110/100) \times (110/100)$

=> Present Population = $10,000 \times (1.1) \times (1.1)$

=> Present Population = $10,000 \times 1.21$

=> Present Population = 12,100

Therefore The correct answer is 12,100.

Additional Information

Compound Growth Formula

Population after 'n' years with growth rate R is $P(1 + R/100)^n$. If the population decreases, use $(1 - R/100)^n$.

Successive Percentage Change

For two successive changes of a% and b%, the effective change is (a + b + ab/100)%. This is useful for population and CI problems.

Fractional Multiplication

A 10% increase is equivalent to multiplying the base value by 11/10. For 2 years, multiply by (11/10) × (11/10) = 121/100.

Q85. Answer: (c) Hugh Dalton

The correct answer is 'Hugh Dalton'.

Key Points

• Professor Hugh Dalton, a renowned British economist, introduced the principle of maximum social advantage as the most fundamental principle underlying public finance.

• The ideal public finance system is one that ensures the maximum social advantage from its fiscal operations.

• The principle of maximum social advantage is a maxim for states, where the social advantage is attained when the marginal social benefit of public expenditure and the marginal social sacrifice of taxation are equal, which is denoted by MSB = MSS. This balance between marginal social benefit and marginal social sacrifice represents the optimal limit of the state's public finance activity.

• Thus, the principle of maximum social advantage is an essential principle of public finance that highlights the importance of achieving an equilibrium between the social benefits of public expenditure and the social cost of taxation. This concept emphasizes the need for governments to strive towards creating a public finance system that maximizes social welfare.

Q86. Answer: (b) 4%

Shortcut Trick

Ratio of Expenditure to Savings = 225 : 100 = 9 : 4.

Total units of Income = 9 + 4 = 13.

Applying Weighted Average for percentage change:

Net change in Income = [9 × (−6%) + 4 × (26.5%)] ÷ 13

Net change = [−54% + 106%] ÷ 13 = 52% ÷ 13 = 4%.

Therefore The correct answer is 4%.

Alternate Method

Given:

Expenditure is 125% more than Savings.

Expenditure decrease = 6% | Savings increase = 26.5%

Formula Used:

Income = Expenditure + Savings

Percentage Change = (Change ÷ Original Value) × 100

=> Let Savings = 100

=> Expenditure = 100 + (125% of 100) = 100 + 125 = 225

=> Income = 225 + 100 = 325

=> Change in Expenditure = −6% of 225 = −(6 ÷ 100) × 225 = −13.5

=> Change in Savings = +26.5% of 100 = +26.5

=> Net change in Income = Change in Exp + Change in Sav = −13.5 + 26.5 = 13

=> % Increase in Income = (13 ÷ 325) × 100

=> % Increase = (1 ÷ 25) × 100 = 4%

Therefore The correct answer is 4%.

Additional Information

Income Relationship

Income is always the sum of Expenditure and Savings (Income = E + S). Any change in income is the algebraic sum of the changes in its components.

Weighted Average in Percentages

When a value is a sum of two parts, the percentage change in the total is the weighted average of the percentage changes in its parts: %ΔTotal = (n1 × %Δ1 + n2 × %Δ2) ÷ (n1 + n2).

Percentage More Than

If A is x% more than B, then A = B × (1 + x/100). For example, 125% more than 100 is 100 + 125 = 225.

Q87. Answer: (c) PK Thungon Committee

The correct answer is ' PK Thungon Committee.'

Key Points

• For the first time, the Thungon Committee suggested giving local government bodies constitutional recognition. It was suggested that the constitution be amended to provide for regular elections to Local Government institutions and the delegation of pertinent duties and resources to them.

• The P.K. Thungon Committee recommended that local governmental entities be given constitutional legitimacy in 1989. It was suggested that the constitution be amended to provide for regular elections to local government entities and the delegation of suitable duties and resources to them.

Q88. Answer: (c) Branch B and branch D

Given:

	2001	2002	2003	2004	2005
Branch A	53	34	54	54	76
Branch B	23	57	65	25	45
Branch C	54	54	56	76	34
Branch D	26	25	45	65	48
Branch E	64	76	76	92	90
Branch F	35	45	56	45	76
Branch G	62	52	45	65	45
Branch H	55	13	76	92	34

Concept used:

Count the policies of different years of each branches. check the above given condition. the pairs of branches have least count will be the.

Calculation:

Total number of policies of branch A = 53 + 34 + 54 + 54 + 76 = 271

Total number of policies of branch B = 23 + 57 + 65 + 25 + 45 = 215

Total number of policies of branch C = 54 + 54 + 56 + 76 + 34 = 274

Total number of policies of branch D = 26 + 25 + 45 + 65 + 48 = 209

Total number of policies of branch E = 64 + 76 + 76 + 92 + 90 = 398

Total number of policies of branch F = 35 + 45 + 56 + 45 + 76 = 257

Total number of policies of branch G = 62 + 52 +45 + 65 + 45 = 269

Total number of policies of branch H = 55 + 13 + 76 + 92 + 34 = 270

Now counting the policies of pair branches given in options,

Option 1 :

Total number of policy sales Branch C and Branch D = 274 + 209 = 483

Option 2:

Total number of policy sales Branch A and Branch E = 271 + 398 = 669

Option 3:

Total number of policy sales Branch B and Branch D = 215 + 209 = 424

Option 4:

Total number of policy sales Branch E and Branch F = 398 + 257 = 655

Here, 'Branch B and Branch D' pair of branches have recorded lowest number of policy sales in these years taken together.

Hence, 'Option 3' is correct.

Q89. Answer: (a) first increases and then declines

The correct answer is 'first increases and then declines'.

Key Points

• The law of variable proportions states: "If a producer increases the units of a variable factor while keeping other factors fixed, then initially the total product increases at an increasing rate, then increases at a diminishing rate, and finally starts declining."

An essential economics theory is the Law of Variable Proportion.

• It is known as the law, according to which the marginal product of a certain factor will decrease if the quantity of that factor is raised while all other factors remain constant.

• According to the law of variable proportions, if a producer increases the units of a variable factor while keeping other elements constant, the total product will initially increase at a rate that is increasing, then increase at a rate that is diminishing, and finally start declining.

Q90. Answer: (a) NaCl

The correct answer is 'NaCl'.

Key Points

• In the given equation, $Na_2SO_4 (aq) + BaCl_2 (aq) \rightarrow BaSO_4 (s) + 2NaCl (aq)$, Sodium and Barium get displaced from Chloride and Sulphate to Sulphate and Chloride respectively.

• Here Double Displacement reaction takes place, AB + CD ----> AD + CB

• Double Displacement reaction: It is a type of chemical reaction in which the reactant ions exchange places to form new products. Usually, a double displacement reaction results in precipitate formation. The chemical bonds between the reactants may be either covalent or ionic.

Additional Information

• Single displacement reactions are defined as those in which one element completely displaces another element from its salt or compound.

• Single displacement reactions are also called single replacement reactions and are expressed as $A + BC \rightarrow AC + B$.

• A sequence of metals arranged in order of increasing reactivity from highest to lowest is known as a reactivity series or activity series.

• Metals' reactivity is caused by either their incomplete outer orbitals or because of their configuration. Metals tend to lose electrons, which causes them to create positively charged ions.

Q91. Answer: (a) Eid Al-Adha

The correct answer is 'Eid AL - Adha'.

Key Points

• Eid al-Adha is the Holy festival of Muslims, which marks the culmination of the Hajj (pilgrimage) in Saudi Arabia, annually celebrated by Muslims throughout the world.

• One of the most important holidays celebrated in Islam begins at sundown Friday.

• Eid al-Adha, also known as the "Feast of Sacrifice," is a holiday celebrated by millions of Muslims worldwide. It commemorates Prophet Ibrahim's devotion to Allah through his willingness to sacrifice his son.

• Millions of Muslims around the world celebrate the festival that marks the end of the annual Hajj pilgrimage. Muslims around the world are celebrating Eid al-Adha, a religious holiday which in Arabic means the “festival of the sacrifice”.

Additional Information

• Hajj is the annual pilgrimage made by Muslims to the holy city of Mecca in Saudi Arabia, in the Middle East.

• It takes place during Dhu'al-Hijjah, which is the final month of the Islamic calendar. In 2021 Hajj started on the evening of 17 July and will continue until 22 July.

Q92. Answer: (a) Increase in CO2 percentage in the air

The correct answer is 'Increase in CO2 percentage in the air'.

Key Points

• Fossil fuels – coal, oil and gas are by far the largest contributor to global climate change, accounting for over 75 per cent of global greenhouse gas emissions and nearly 90 per cent of all carbon dioxide emissions.

• As greenhouse gas emissions blanket the Earth, they trap the sun's heat.

• The main cause of global warming is the excess of greenhouse gases in the atmosphere.

• Carbon dioxide is the major greenhouse gas.

Additional Information

• “Global warming” refers to the rise in global temperatures due mainly to the increasing concentrations of greenhouse gases in the atmosphere.

• “Climate change” refers to the increasing changes in the measures of climate over a long period of time – including precipitation, temperature, and wind patterns.

Q93. Answer: (b) 62/3% gain

Shortcut Trick

Total Cost Price (CP) = [650 ÷ (1 + 30%)] + [950 ÷ (1 − 5%)] = 500 + 1000 = 1500.

Total Selling Price (SP) = 650 + 950 = 1600.

Overall Profit = 1600 − 1500 = 100.

Overall Gain % = (100 ÷ 1500) × 100 = 100 ÷ 15 = 20 ÷ 3 = 6(2/3)%.

Therefore The correct answer is 6(2/3)% gain.

Alternate Method

Given: SP1 = 650, Profit1 = 30%; SP2 = 950, Loss2 = 5%.

Formulas: CP = [SP × 100] ÷ [100 ± P/L%]; Gain% = (Total SP − Total CP) ÷ Total CP × 100.

=> CP1 = (650 × 100) ÷ 130 = 500.

=> CP2 = (950 × 100) ÷ 95 = 1000.

=> Total CP = 500 + 1000 = 1500.

=> Total SP = 650 + 950 = 1600.

=> Gain = 1600 − 1500 = 100.

=> Gain% = (100 ÷ 1500) × 100 = 20/3% = 6(2/3)%.

Therefore The correct answer is 6(2/3)% gain.

Additional Information

Cost Price and Selling Price

The Cost Price (CP) is the price at which an item is purchased, and Selling Price (SP) is the price at which it is sold. Profit occurs when SP > CP.

Profit and Loss Percentage

Profit or Loss percentage is always calculated on the Cost Price unless specified otherwise. Formula: (Profit/Loss ÷ CP) × 100.

Q94. Answer: (b) CH4

The correct answer is CH4.

Key PointsTo know the nature of bonds, we will note the valency of different atoms in the molecule or compound and then draw their structures.

• O2: Oxygen atoms are connected to each other by a double bond as the valency of oxygen atom is 2.

• CH4: Carbon has a valency of 4, thus 4 H are connected to the single carbon with the help of 4 single bonds.

• N2: Nitrogen is a diatomic linear molecule which is connected through a triple bond, because nitrogen atom has a valency of 3.

• CO2: In carbon dioxide, the valency of Carbon is 4, while the valency of oxygen atoms is 2. Thus, the carbon will be joined to oxygens through 2 double bonds as shown below:

Thus, only CH4 has single bond present.

Q95. Answer: (a) K

According to given information, we have the possible arrangements as follows:

1). N ran faster than M but slower than L.

L > N > M

2). M ran slower than J but faster than O.

O > M > J

3). K ran faster than L.

K > L

4). J ran slower than L

L > J

After combining all the arrangements, we get:

K > L > N, O > M > J

Here, 'K' among the six ran the fastest.

Hence, "option 1" is the correct answer.

Q96. Answer: (b) 47

Shortcut Trick

For any odd number of terms in an Arithmetic Progression (consecutive numbers), the middle number is the average of the terms.

Middle number = Total Sum ÷ Number of terms

Middle number = 141 ÷ 3 = 47

Therefore The correct answer is 47.

Alternate Method

Given:

Sum of three consecutive natural numbers = 141

Formula Used:

Let the numbers be (x − 1), x, and (x + 1).

Sum = (x − 1) + x + (x + 1)

Calculations:

=> (x − 1) + x + (x + 1) = 141

=> 3x = 141

=> x = 141 ÷ 3

=> x = 47

The middle number is x = 47.

Therefore The correct answer is 47.

Additional Information

Consecutive Even/Odd Numbers

For consecutive even or odd numbers, the common difference is 2. The terms are represented as x, x+2, x+4...

Average Property

In any sequence with a constant difference, the average is always exactly the middle term if the number of terms is odd.

Natural Numbers

Natural numbers are counting numbers starting from 1 (1, 2, 3, ...). The difference between any two consecutive natural numbers is always 1.

Q97. Answer: (c) Both Statements are correct. Statement II is related to Statement I.

The correct answer is Both statements are correct. Statement II is related to Statement I.

Key Points

• Urtica Dioica is a scientific name of the stinging nettle.

• Due to the infusion of chemicals like methanoic acid (formic acid) and histamine into the epidermis, touching nettle plants unintentionally causes discomfort and burning.

• They contain histamine and other substances, and the histamine is what causes the initial reaction when you are stung.

• The histamine in the venom is prevented from generating irritation and discomfort by the antihistamine in dock leaves.

• Baking soda ($NaHCO_3$) can be used to soothe the burning sensation brought on by acid.

• By virtue of its alkaline nature, baking soda neutralizes the effects of methanoic acid and provides relief when applied to sting sites.

• Thus, both statements are correct and are related to others.

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Q98. Answer: (d) concentric circles

The correct answer is 'Concentric circles'.

Key Points

• Maxwell's right hand thumb rule: According to Maxwell's right hand thumb rule if we tend to hold a straight current carrying wire in our right hand such that our thumb represents the direction of the current then the curls of our finger would represent the direction of the magnetic field lines.

• A circular loop of wire can be broken into tiny straight line conductors or one straight line conductor made to join end to end.

• From Maxwell's right hand thumb rule, the lines of magnetic field due to the current carrying circular loop are concentric circles about the axis of straight wire.

Q99. Answer: (b) India

The correct answer is 'India'.

Key Points

• India won the SAFF Under-18 Football Championship by defeating Bangladesh by 2-1 in the final held in Kathmandu, Nepal.

• The SAFF U-18/U-19/20 Women's Championship is a biennial international association football tournament for women's national football teams under the age of 18/19/20, governed by the South Asian Football Federation (SAFF).

• The result was declared because of a better goal difference. India enjoyed a better goal difference of +11 in comparison to +3 of Bangladesh.

• The valuable player of the tournament and the highest goal scorer was Lynda Kom who scored five goals.

Additional Information

• South Asian Football Federation (SAFF), founded in 1997, is an association of the football-playing nations in South Asia and is part of the larger Asian Football Confederation.

• The members of the association are India, Bangladesh, Bhutan, Maldives, Nepal, Pakistan and Sri Lanka.

Q100. Answer: (a) Rs. 60

Shortcut Trick

Divide the first condition by 2: 1 kg Apples + 1 kg Grapes = 160 ÷ 2 = Rs. 80.

Multiply this by 3: 3 kg Apples + 3 kg Grapes = 80 × 3 = Rs. 240.

Subtract this from the second condition: (4 kg Apples + 3 kg Grapes) − (3 kg Apples + 3 kg Grapes) = 300 − 240.

This directly gives the cost of 1 kg Apples = Rs. 60.

Therefore The correct answer is Rs. 60.

Alternate Method

Given:

Cost of 2 kg Apples and 2 kg Grapes = Rs. 160

Cost of 4 kg Apples and 3 kg Grapes = Rs. 300

Formula Used:

Simultaneous Linear Equations: a1x + b1y = c1 and a2x + b2y = c2

Calculations:

Let the cost of Apples per kg be x and Grapes per kg be y.

=> 2x + 2y = 160

=> x + y = 80 → (Equation 1)

=> 4x + 3y = 300 → (Equation 2)

From Equation 1, y = 80 − x. Substituting this in Equation 2:

=> 4x + 3(80 − x) = 300

=> 4x + 240 − 3x = 300

=> x = 300 − 240

=> x = 60

Therefore The correct answer is Rs. 60.

Additional Information

Elimination Method

This involves multiplying equations by specific constants so that the coefficients of one variable become equal, allowing its removal by subtraction or addition.

Substitution Method

Solving one equation for one variable (e.g., x = f(y)) and substituting that expression into the other equation to find the value of the second variable.

Nature of Linear Equations

Two lines a1x + b1y + c1 = 0 and a2x + b2y + c2 = 0 have a unique solution if a1/a2 ≠ b1/b2.

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