# RRB Group D Previous Year Paper (Held on: 17 Aug 2022 Shift 2)

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

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

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## CBT

**Q1.** Find the median of the data 11, 16, 33, 15, 51, 18, 71, 75, 22, 17.

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

**Q2.** Simplify $(3^2)^3 + (2^3)^2$.

**(a)** 729
**(b)** 793
**(c)** 379
**(d)** 739

**Q3.** Mawsynram is the wettest place on earth and it is situated in _____.

**(a)** Mahadeo Hills
**(b)** Lushai Hills
**(c)** Rajmahal Hills
**(d)** Khasi Hills

**Q4.** Last year, Ranjan's monthly salary was Rs. 34,500 and this year his monthly salary is Rs. 38,640. What is the percentage increase in Ranjan's monthly salary in this year over his monthly salary last year?

**(a)** 20%
**(b)** 12%
**(c)** 15%
**(d)** 13%

**Q5.** In January 2022, GAIL started India's maiden project of blending hydrogen into natural gas system at which place?

**(a)** Gwalior
**(b)** Indore
**(c)** Ujjain
**(d)** Bhopal

**Q6.** To reach point B from point A, Anita must walk 70 m towards the west, then she must take a right turn and walk 70 m, then she must take a left turn and walk 150 m, then she must take a left turn and walk 70 m, then she must take a left turn and walk 90 m, then she must take a right turn and walk 100 m, and finally she must take a left turn and walk 130 m. How far and in which direction is point B from point A ? (All turns are 90 degree turns only)

**(a)** 130 m, North
**(b)** 130 m, South
**(c)** 100 m, South
**(d)** 100 m, North

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**Q7.** Which of the following numbers will replace the question mark (?) in the given series?

11, 21, 47, 97, 179, ?

**(a)** 281
**(b)** 301
**(c)** 231
**(d)** 295

**Q8.** Three statements are given, followed by three conclusions numbered I, II and III. Assuming the statements to be true, even if they seem to be at variance with commonly known facts, decide which of the conclusions logically follow(s) from the statements.

Statements:

All phones are tablets.

No tablet is a calculator.

All drives are calculators.

Conclusions:

I. Some drives are phones.

II. Some calculators are phones.

III. No tablet is a drive.

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

**Q9.** Which factor(s) led scientists towards the classification of elements?

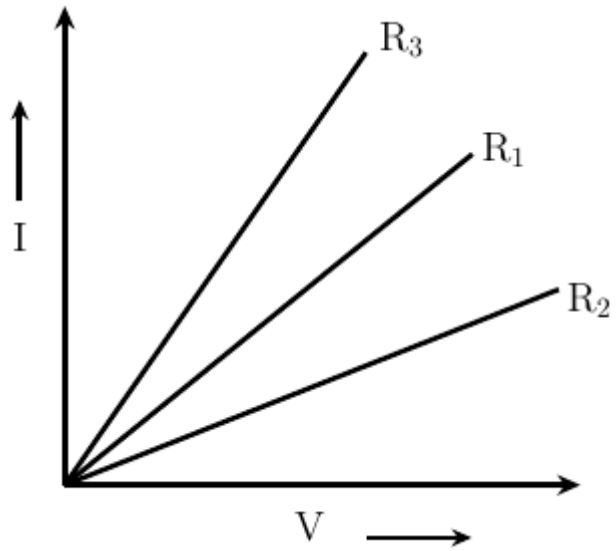
(i) Different methods of synthesis of elements

(ii) Different source of elements

(iii) Different properties of elements

**(a)** i, ii, iii
**(b)** Only ii
**(c)** Only iii
**(d)** Only i

**Q10.** The I-V graph of three resistances R1, R2 and R3 is shown in the figure below. The correct relation between R1, R2 and R3 is:




**(a)** R1 > R2 > R3
**(b)** R3 > R1> R2
**(c)** R3 < R1 < R2

**(d)** R1 < R2 < R3

**Q11.** Bharat Heavy Electricals Limited was registered as Heavy Electricals (India) Limited (HE(I)L) in the Public Sector under the Ministry of Industry and Commerce on 29^(th) August, _____.

**(a)** 1962
**(b)** 1969
**(c)** 1952
**(d)** 1956

**Q12.** Which action taking place in the digestive system of humans is similar to the emulsifying action of soaps on dirt?

**(a)** Bile salts breaking large fat globules into smaller ones
**(b)** Bile juice enzymes helping in digestion of starch
**(c)** Bile juice providing acidic medium
**(d)** Bile juice providing alkaline medium

**Q13.** The distance between the focus and the centre of curvature of a spherical mirror in terms of the radius of curvature R, is equal to :

**(a)** 2R
**(b)** R/2
**(c)** R/4
**(d)** R

**Q14.** Seven friends, P, Q, R, S, T, U and V, are sitting around a circular table. All are facing the centre of the table. Only R is sitting between Q and S. Only T is sitting between P and V. V is sitting third to the right of Q. V is third to the left of U. Who is sitting to the immediate right of R?

**(a)** S
**(b)** T
**(c)** P
**(d)** V

**Q15.** Based on the given statement, two conclusions are drawn. Find out which conclusion is true based on the statement.

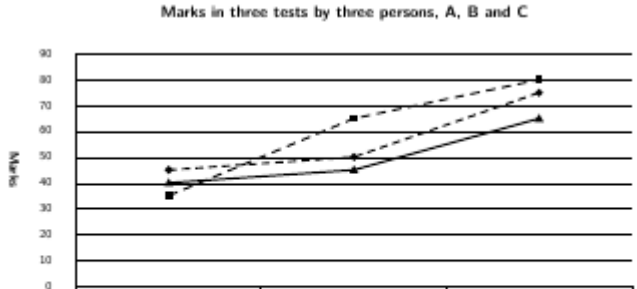
Statement : Z > R ≥ Y > P = Q ≤ N < S

Conclusion :

1. P > S
2. Z < Q

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

**Q16.** The graph and the table below show the marks obtained by three persons, A, B and C, in three tests, Test 1, Test 2 and Test 3. Study the graph and the table and answer the question.



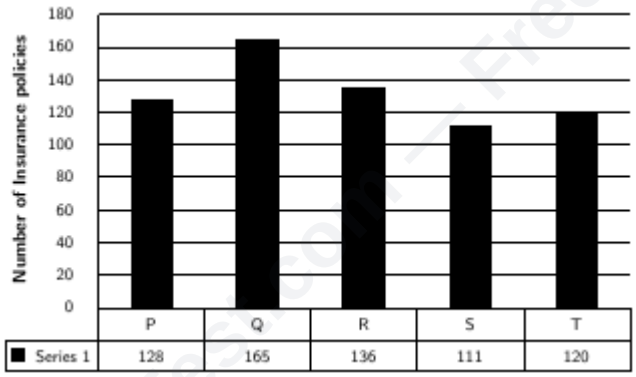

| | Test 1 | Test 2 | Test 3 |
|---|---|---|---|
| A | 45 | 50 | 75 |
| B | 35 | 65 | 80 |
| C | 40 | 45 | 85 |

If the maximum marks for both Test 1 and Test 2 are 80, and the maximum marks for Test 3 are 100, then how much

percentage has A scored more than C considering the performance on all three tests?

**(a)** 13.33%
**(b)** 8.2%
**(c)** 5.56%
**(d)** 6.92%

**Q17.** The following chart shows the numbers of insurance policies sold by five salespersons named P, Q, R, S and T. Study the chart and answer the question.




What is the percentage share of insurance policies sold by Q in the total insurance policies sold by all five salespersons?

**(a)** 30%
**(b)** 25%
**(c)** 20%
**(d)** 28%

**Q18.** When chlorination of dry slaked lime takes place, _____ will form as the main product.

**(a)** hydrochloric acid
**(b)** calcium oxychloride
**(c)** quicklime
**(d)** acetic acid

**Q19.** 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.

COWBOY : WOCYOB

TANGLE : NATELG

**(a)** PICKLE : CIPLKE
**(b)** CROWDS : ORDWSC
**(c)** FLOWER : OLFREW
**(d)** MANGLE : NMALEG

**Q20.** Which of the following is the most beneficial for a customer?

Scheme 1.) Buy 5 get 3 free

Scheme 2.) Buy 5 get 6 free

Scheme 3.) Two successive discounts of 10% and 5%

**(a)** Scheme 2 and 3 both
**(b)** Scheme 1
**(c)** Scheme 2
**(d)** Scheme 1 and 2 both

**Q21.** What is the rank of India in the Human Development Index, 2020, prepared by the United Nations Development Programme (UNDP) as per the report released in 2021?

**(a)** 131^(st)
**(b)** 161^(st)
**(c)** 135^(th)

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**(d)** 128^(th)

**Q22.** Select the set in which the numbers are related in the same way as are the numbers of the following sets.

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

(12, 15, 18)

(45, 35, 25)

**(a)** (13, 10, 17)
**(b)** (19, 18, 1)
**(c)** (15, 20, 25)
**(d)** (14, 28, 14)

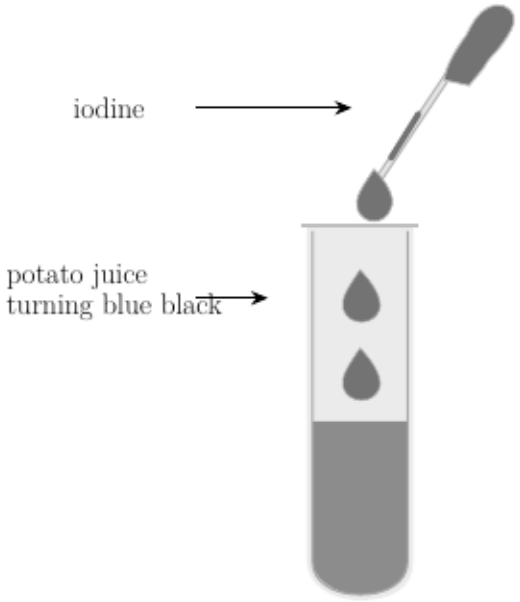
**Q23.** The Sangai deer is an endemic species found in which of the following Indian states?

**(a)** Rajasthan
**(b)** Telangana
**(c)** Manipur
**(d)** Kerala

**Q24.** Express 0.42424... in the form p/q, where p and q are integers q ≠ 0.

**(a)** 41/990
**(b)** 14/33
**(c)** 13/33
**(d)** 41/165

**Q25.** Study the given diagram carefully. Which option correctly explains the reason for the appearance of the blue black colour?




**(a)** Potato juice contains proteins, which turn blue black with iodine
**(b)** Potato juice contains starch, which turns blue black with iodine
**(c)** Potato juice contains glucose, which turns blue black with iodine
**(d)** Potato juice contains fats, which turn blue black with iodine

**Q26.** Which of the following numbers will replace the question mark (?) in the given series?

124, 129, 136, 145, 156, ?

**(a)** 168
**(b)** 169
**(c)** 172

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**(d)** 165

**Q27.** A textbook has a total of 892 pages. It is divided into two parts. The second part of the book has 52 pages less than the first part. How many pages are there in the second part of the book?

**(a)** 464
**(b)** 482
**(c)** 420
**(d)** 472

**Q28.** The presence of which bacteria is an indicator of water pollution?

**(a)** Salmonella typhi
**(b)** Vibrio cholerae
**(c)** E. coli Coliform
**(d)** Mycobacterium tuberculosis

**Q29.** Which of the following parts helps in exchange of gases in plants?

**(a)** Cell membrane
**(b)** Nucleus
**(c)** Stomata
**(d)** Guard cells

**Q30.** Which of the following elements has the maximum number of atoms in their molecular form?

**(a)** S
**(b)** P
**(c)** Ar
**(d)** Ne

**Q31.** When three parallel lines are cut by two transversals and the intercepts made by the first transversal are in the ratio 3 : 4, then the intercepts made by the second transversal are in the ratio _____.

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

**Q32.** In this question, a group of numbers/symbols is coded using letters as per the table given below and the conditions which follow. The correct combination of codes following the conditions is your answer.

| **Number /symbol** | **9** | **5** | **3** | **#** | **6** | **&** | **7** | **@** | **%** | **8** | **2** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | L | K | J | H | G | F | D | S | A | P | B |

conditions :

(i) If the first two elements are numbers and the last is a symbol, then interchange the codes for the second number and the last symbol.

(ii) If the second element is a symbol and the last is a symbol, then all the symbols are to be coded as C.

(iii) If the question has any number which is immediately preceded by a prime number, then interchange the codes of the first and last number appearing in the question.

Question: 7 9 & 8 % # 3

**(a)** DL&P%#J
**(b)** DLGPSJJ
**(c)** JLFPAHD
**(d)** SLFPAHJ

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**Q33.** Cyclohexane contains ____ C-C bonds and __ C-H bonds, so total ____ covalent bonds.

**(a)** 4, 8, 12
**(b)** 4, 12, 16
**(c)** 6, 10, 16
**(d)** 6, 12, 18

**Q34.** The armature of an electric motor consists of which of the following part/parts?

(i) Soft iron core
(ii) Coil
(iii) Magnets

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

**Q35.** Study the given letter, symbol series and answer the question that follows.

9 1 @ 4 * 7 ^ 5 3 # 9 1 < 5 4 @ 3 $ # 2 * 6 ! 4 2 & 9 < 3 6 # 2 % 2 @ 7

If all even numbers in the given series are replaced with a number which is prime as well as even number, then how many numbers are there in the resultant series thus formed which are immediately preceded by a prime number and immediately followed by a symbol?

**(a)** 3
**(b)** 5
**(c)** 2
**(d)** 4

**Q36.** Which of the following rivers originates from Amarkantak Hills?

**(a)** Teesta
**(b)** Sutlej
**(c)** Narmada
**(d)** Godavari

**Q37.** In a certain code language, 'FUEL' is written as '50' and 'JEER' is written as '44'. How will 'FARE' be written in that language?

**(a)** 36
**(b)** 40
**(c)** 34
**(d)** 38

**Q38.** What fraction of the positions in all panchayat institutions is reserved for women?

**(a)** 1/4
**(b)** 1/2
**(c)** 1/5
**(d)** 1/3

**Q39.** If '+' means '÷ '-' means '×', '×' means '+', '÷' means '-', what will come in place of the question mark (?) in the following equation?

16 + 4 - 8 ÷ 3 × 2 = ?

**(a)** 23
**(b)** 14
**(c)** 22
**(d)** 31

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**Q40.** Which of the following is not an example of redox reaction?

(i) $ZnO + C \rightarrow Zn + CO$

(ii) $MnO2 + 4HCl \rightarrow MnCl2 + 2H2O + Cl2$

(iii) $4Na + O2 \rightarrow 2Na2O$

(iv) $AgNO3 + NaCl \rightarrow AgCl + NaNO3$

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

**Q41.** Navroz festival is associated with which of the religious communities?

**(a)** Jain
**(b)** Sikh
**(c)** Parsi
**(d)** Buddhist

**Q42.** The famous Haji Ali Dargah is located in which of the following cities?

**(a)** Hyderabad
**(b)** Delhi
**(c)** Mumbai
**(d)** Ajmer

**Q43.** Consider the below statements and identify the correct answer.

Statement - I : Anhydrous sodium carbonate is used in soda-acid fire extinguishers.

Statement - II : Anhydrous sodium carbonate is dissolved in water and recrystallized to get washing soda crystals containing 10 molecules of water of crystallisation

**(a)** Both the statements are true.
**(b)** Both the statements are false.
**(c)** Statement - I is true, and Statement - II is false.
**(d)** Statement - II is true, and Statement - I is false.

**Q44.** If 2 is added to each odd digit and 1 is subtracted from each even digit in the number 34135278, what will be the sum of the digits that are third from the left and third from the right?

**(a)** 4
**(b)** 3
**(c)** 1
**(d)** 7

**Q45.** Which part of the Indian Constitution has only one Article 51-A, which deals with the Code of 11 Fundamental Duties for the Citizens?

**(a)** Part IV-A
**(b)** Part V
**(c)** Part IXA
**(d)** Part VII

**Q46.** Which of the following terms will replace the question mark (?) in the given series to make it logically complete?

UCK - 4, WFO - 9, YIS - 19, ALW - 39, ?

**(a)** COA - 79
**(b)** BOA - 76
**(c)** COA - 77
**(d)** CPB - 79

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**Q47.** Study the given arrangement carefully and answer the question that follows.

(Left) 3 ^ % 7 2 4 £ 3 ¥ 4 ρ @ 8 8 & 6 @ 1 (Right)

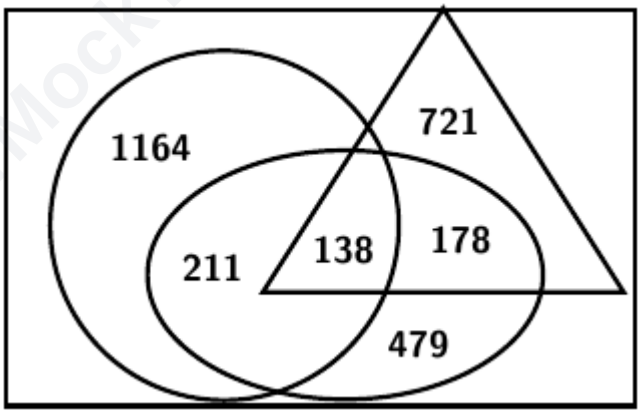
How many such numbers are there in the above arrangement each of which is immediately followed by a symbol and also immediately preceded by a symbol?

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

**Q48.** The mean of 36 numbers was found as 42. Later on, it was determined that a number 47 was misread as 41. Find the correct mean of the given numbers (rounded off to two places of decimal).

**(a)** 43.74
**(b)** 42.17
**(c)** 42.83
**(d)** 43.62

**Q49.** The rectangle represents students, the circle represents girls, the oval represents arts stream, and the triangle represents sports. The numbers in different sections indicate the number of persons. How many girl students have taken arts stream and do NOT play sports and what is the total number of students who play sports but are NOT girls, and have taken arts stream?




**(a)** 479 and 211, respectively
**(b)** 138 and 178, respectively
**(c)** 211 and 178, respectively
**(d)** 138 and 479, respectively

**Q50.** A is twice as old as B. B is 1/3 as old as C. The sum of ages of A, B and C is 42 years, find the sum of the ages of A and B.

**(a)** 21 years
**(b)** 23 years
**(c)** 15 years
**(d)** 12 years

**Q51.** Find the value of $(\sin^2 22° + \sin^2 68°)$ to $(\cos^2 33° + \cos^2 57°)$.

**(a)** 1 : 4
**(b)** 2 : 1
**(c)** 1 : 2
**(d)** 1 : 1

**Q52.** The LCM of 96, 144 and another number, x, is 576. Which of the values given below can be the value of x?

**(a)** 144
**(b)** 192
**(c)** 288
**(d)** 96

**Q53.** Suneet walked 10 m towards the north, then he turned left and walked 11 m, then from there he turned right and walked 13 m, and then he turned right again and walked 25 m. In which direction is Suneet facing now?

(All turns are 90 degree turns only)

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

**Q54.** In which year was The Indian Museum Act passed?

**(a)** 1909
**(b)** 1910
**(c)** 1921
**(d)** 1915

**Q55.** In accordance to Fleming's left hand rule used to find the force on a current carrying conductor placed inside a magnetic field, the thumb and the index finger represent the directions of ____ and ____, respectively.

**(a)** field, current
**(b)** magnetic field, force
**(c)** force, magnetic field
**(d)** current, field

**Q56.** If 15 March 2022 was a Tuesday, what day of the week was 15 March 2020?

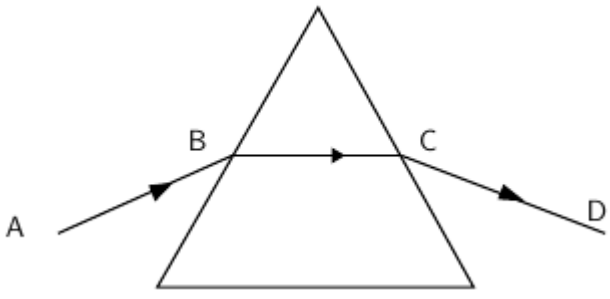
**(a)** Friday
**(b)** Sunday
**(c)** Saturday
**(d)** Monday

**Q57.** S, T, U, V, W and X live on six different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it is numbered 2, and so on till the topmost floor is numbered 6.

V lives on the lowermost floor. X and U each live on an even numbered floor. T lives exactly between U and W. W lives on floor number 2. Who lives on floor number 5?

**(a)** S
**(b)** T
**(c)** X
**(d)** U

**Q58.** In the figure shown below, the incident ray and the emergent ray in the respective order are given by:




**(a)** AB and CD
**(b)** AB and BC
**(c)** CD and AB
**(d)** BC and CD

**Q59.** If the volume of a sphere is 36 π $cm^3$, then the diameter of the sphere is :

**(a)** 9 cm
**(b)** 27 cm
**(c)** 3 cm

**(d)** 6 cm

**Q60.** What is the nature of the roots of $3x^2 + 6x - 5 = 0$ ?

**(a)** There are no real roots.
**(b)** The roots are real and equal.
**(c)** The roots are real and distinct.
**(d)** The roots are real and more than 2.

**Q61.** At simple interest, a certain sum of money amounts to Rs. 1,250 in 2 years and to Rs. 2,000 in 5 years. Find the rate of interest per annum (rounded off to two places of decimal).

**(a)** 33.33%
**(b)** 16.67%
**(c)** 27.27%
**(d)** 11.11%

**Q62.** Which of the following is divisible by both 4 and 8?

**(a)** 4382
**(b)** 3824
**(c)** 8342
**(d)** 3842

**Q63.** An object placed at a distance of 25 cm from a converging lens forms a real and inverted image at 30 cm from the lens. The magnification produced by the lens is equal to :

**(a)** -5/6
**(b)** -6/5
**(c)** 6/5
**(d)** 5/6

**Q64.** Formation of urine in the kidneys involves the given three processes in which of the following sequences?

**(a)** Filtration, elimination, selective reabsorption
**(b)** Filtration, selective reabsorption, Elimination
**(c)** Selective reabsorption, filtration, elimination
**(d)** Selective reabsorption, elimination, filtration

**Q65.** Which of the following ‘state – major language' pairs has been INCORRECTLY matched?

**(a)** Andhra Pradesh - Telugu
**(b)** Manipur - Meitei
**(c)** Meghalaya - Khasi
**(d)** Kerala - Kannada

**Q66.** Which of the following is an example of sexual reproduction?

**(a)** Budding
**(b)** Fragmentation
**(c)** Pollination
**(d)** Binary Fission

**Q67.** In context of Consumer Rights, what is the full form of COPRA?

**(a)** Consumer Protection Agency
**(b)** Consumer Protection Alliance
**(c)** Consumer Protection Act
**(d)** Consumer Protection Association

**Q68.** Refer to the following number series and answer the question.

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

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

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**(a)** 3
**(b)** 5
**(c)** 4
**(d)** 2

**Q69.** P, Q, R, S, T, U and V live on seven different floors of the same building. The lowermost floor in the building is numbered 1, the floor above it is number 2, and so on till the topmost floor is numbered 7. Q lives on floor number 2. R lives on the floor immediately above U's floor. S is on the floor immediately below V's floor. Only three persons live between the floors of T and P. R lives on the topmost floor. Only one person lives between the floors of R and P. On which floor does P live?

**(a)** Floor 4
**(b)** Floor 5
**(c)** Floor 3
**(d)** Floor 2

**Q70.** 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)

(35, 12, 29)

(23, 16, 31)

**(a)** (21, 25, 29)
**(b)** (33, 30, 27)
**(c)** (18, 12, 21)
**(d)** (19, 8, 23)

**Q71.** The product of the roots of $3x^2 - 13x + 6 = 0$ is :

**(a)** 5
**(b)** 4
**(c)** 3
**(d)** 2

**Q72.** What is the total number of shells involved in electronic configuration of carbon?

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

**Q73.** 5 men and 6 women can do a piece of work in 6 days while 3 men and 5 women can do the same work in 9 days. In how many days can 3 men and 2 women do the same work?

**(a)** 11 5/11 days
**(b)** 13 3/11 days
**(c)** 10 9/11 days
**(d)** 12 1/11 days

**Q74.** Who prepared the first estimates of the national income of India in 1876?

**(a)** Dadabhai Naoroji
**(b)** PC Mahalanobis
**(c)** VKRV Rao
**(d)** William Dagboi

**Q75.** Find the amount of water contained in a cylindrical tank of radius 7 m and height 20 m. It is known that the tank is completely filled.

**(a)** 4250 $m^3$
**(b)** 3125 $m^3$

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**(c)** 5110 $m^3$
**(d)** 3080 $m^3$

**Q76.** According to data from Centre for Monitoring the Indian Economy, which state has witnessed highest unemployment rate in January 2022?
**(a)** Haryana
**(b)** Punjab
**(c)** Himachal Pradesh
**(d)** Rajasthan

**Q77.** Any reaction that produces an insoluble precipitate can be called a :
**(a)** redox reaction
**(b)** displacement reaction
**(c)** precipitation reaction
**(d)** decomposition reaction

**Q78.** A given resistance R is cut into 2 equal parts. The resistance of each part is :
**(a)** 2R
**(b)** R/4
**(c)** R
**(d)** R/2

**Q79.** 14 years ago, the age of a father was three times the age of his son. Now, the father is twice as old as his son. What is the sum of the present ages of the father and the son?
**(a)** 84 years
**(b)** 56 years
**(c)** 42 years
**(d)** 98 years

**Q80.** In this question, a statement is followed by two conclusions. Which of the two conclusions is / are true with respect to the statement?
Statement: $H > Y \geq S = X = A > W$
Conclusions:
I. $H < S$
II. $A \leq Y$
**(a)** Both conclusions I and II are true
**(b)** Only conclusion I is true
**(c)** Neither conclusion I nor II is true
**(d)** Only conclusion II is true

**Q81.** A statement is given followed by two arguments I and II. Read the statement and the arguments carefully and select the appropriate answer from the given options.
Statement :
Apartment complexes have decided to charge a heavy penalty on residents who do not segregate their dry waste and wet waste.
Arguments :
I. The government has mandated segregation of wet waste and dry waste by all homeowners.
II. All apartments have been provided with separate bins for dry waste and wet waste to facilitate garbage segregation.
**(a)** Both arguments I and II strengthen the statement
**(b)** Both arguments I and II weaken the statement
**(c)** Argument II weakens, while argument I strengthens the statement
**(d)** Argument I weakens, while argument II strengthens the statement

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**Q82.** The percentage profit earned by James by selling an article for Rs. 1,920, equals the percentage loss suffered by selling it at Rs. 1,500. What should be the selling price if he wants to earn 10% profit?

**(a)** Rs. 7,000
**(b)** Rs. 2,000
**(c)** Rs. 4,000
**(d)** Rs. 1,881

**Q83.** Article 279A is related to which of the following constitutional bodies?

**(a)** Goods and Service Tax Council
**(b)** Election Commission of India
**(c)** Finance Commission
**(d)** UPSC

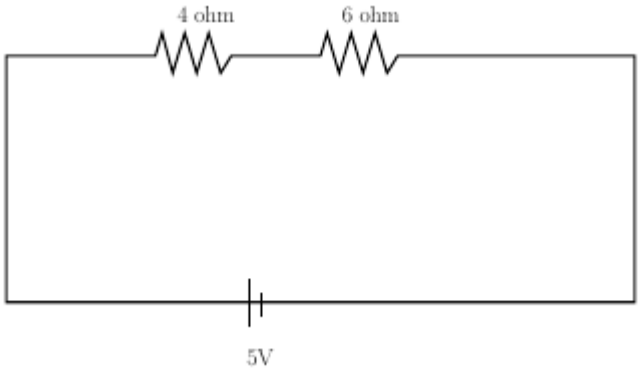
**Q84.** In May 2022, which of the following state Chief Minister Basavaraj Bommai has launched a new health and wellness scheme app AAYU?

**(a)** Andhra Pradesh
**(b)** Kerala
**(c)** Karnataka
**(d)** Tamil Nadu

**Q85.** For outstanding contribution in which of the following sports did TP Ouseph win the Dronacharya Award for 2021?

**(a)** Weightlifting
**(b)** Athletics
**(c)** Boxing
**(d)** Table Tennis

**Q86.** The potential drop across the 4 Ω resistor in the given circuit is :




**(a)** 5V
**(b)** 3 V
**(c)** 2 V
**(d)** 0.5 V

**Q87.** The expansion of $(3a - 4b - 2c)^2$ is:

**(a)** $9a^2 + 16b^2 + 4c^2 - 24ab + 8bc + 12ac$
**(b)** $9a^2 + 16b^2 + 4c^2 + 12ab - 8bc + 6ac$
**(c)** $9a^2 + 16b^2 + 4c^2 - 24ab + 16bc - 12ac$
**(d)** $9a^2 + 16b^2 + 4c^2 - 24ab + 16bc - 6ac$

**Q88.** Soil erosion is one of the major threats to the environment. Which of the following can help to prevent erosion of soil?

**(a)** Poor irrigation practices
**(b)** Over-cultivation
**(c)** Cattle grazing
**(d)** Contour ploughing

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**Q89.** Sandhya Gurung received the Dronacharya Award, 2021, for coaching in the field of _____.

**(a)** Kabaddi
**(b)** Swimming
**(c)** Boxing
**(d)** Shooting

**Q90.** There are four different points on a plane such that no three are collinear. The number of distinct straight lines that can be drawn through them is:

**(a)** 8
**(b)** 4
**(c)** 2
**(d)** 6

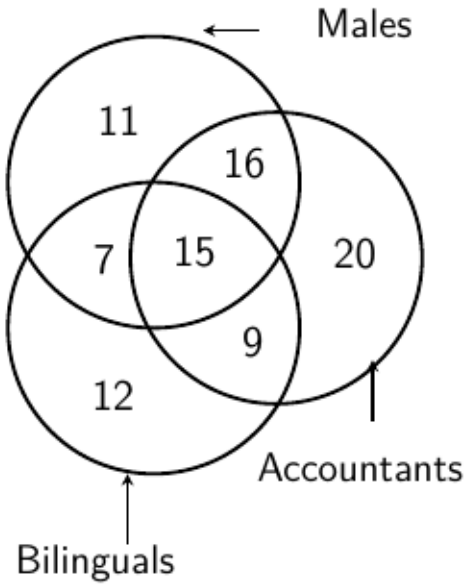
**Q91.** The distance between the pole and centre of curvature of a spherical mirror, in terms of its focal length f, is equal to:

**(a)** f / 2
**(b)** 2f
**(c)** f
**(d)** f / 4

**Q92.** Divij, Palak, Ravneet, Sejal and Tapan are sitting around a circular table facing the centre of the table. Only Palak is sitting between Ravneet and Tapan. Tapan is second to the right of Sejal. Only Sejal is between Ravneet and Divij. Who is sitting to the immediate left of Tapan?

**(a)** Palak
**(b)** Divij
**(c)** Ravneet
**(d)** Sejal

**Q93.** Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of persons.




How many such accountants are there who are also bilinguals?

**(a)** 9
**(b)** 22
**(c)** 24
**(d)** 15

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**Q94.** During adolescence, several changes occur in the human body. Which of the following changes is associated with sexual maturation only in girls?

**(a)** Oily skin with pimples
**(b)** Growth of hair on different parts of the body
**(c)** Conscious of their looks
**(d)** Growth of mammary glands

**Q95.** A, B and C started a business. They partnered for 6 months, 12 months and 14 months respectively. If their profit is in the ratio 5 : 4 : 7 respectively, then the ratio of their respective investments is _____.

**(a)** 5 : 2 : 3
**(b)** 1 : 5 : 3
**(c)** 2 : 3 : 7
**(d)** 2 : 3 : 5

**Q96.** Select the correct combination of mathematical signs that can sequentially replace * to balance the following equation.

20 * 4 * 6 * 2 * 14 * 18

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

**Q97.** Reena reaches a birthday party 20 min late if she walks 3 km/h from her house. If she increases her speed to 4 km/h she would reach 30 min early, then the distance between her house and the venue of the birthday party is

**(a)** 4 km
**(b)** 9 km
**(c)** 7 km
**(d)** 10 km

**Q98.** In December 2021, which state Government inaugurated the 'Pink Force' of Police to enhance safety, security of women and children?

**(a)** Kerala
**(b)** Sikkim
**(c)** Goa
**(d)** Meghalaya

**Q99.** 6124.8 × 625.5 × 0.0043 is equal in value to :

**(a)** 612.48 × 625.5 × 0.43
**(b)** 61.248 × 6255 × 0.043
**(c)** 6.1248 × 62.55 × 0.43
**(d)** 6.1248 × 62.55 × 0.043

**Q100.** O, P, Q, R, S, T and U are seven boxes that are kept one over the other but not necessarily in the same order. Only one box is kept between R and P. Only one box is kept between S and T. Only one box is kept between P and Q. Q is kept at the lowermost position. T is kept immediately above Q. How many boxes are kept between S and Q?

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

## ANSWER KEY

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

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

## SOLUTIONS

**Q1. Answer: (b) 20**

Shortcut Trick

To find the median, quickly sort the given data values in ascending order.

Sorted Array: 11, 15, 16, 17, 18, 22, 33, 51, 71, 75

Since there are 10 terms, the median is the average of the two middle terms (5^(th) and 6^(th)).

Median = (18 + 22) ÷ 2 = 20

Therefore The correct answer is 20.

Alternate Method

Given:

Data set: 11, 16, 33, 15, 51, 18, 71, 75, 22, 17

Total number of terms (N) = 10

Formula Used:

For an even number of observations, Median = [(N ÷ 2)^(th) term + (N ÷ 2 + 1)^(th) term] ÷ 2

Sorted Data Array

11

15

16

17

18

22

33

51

71

75

Median = (18 + 22) / 2 = 20

Calculation:

=> Arrange data in ascending order: 11, 15, 16, 17, 18, 22, 33, 51, 71, 75

=> Here N = 10 (even), so we find the 5^(th) and 6^(th) terms.

=> 5^(th) term = 18

=> 6^(th) term = 22

=> Median = (18 + 22) ÷ 2

=> Median = 40 ÷ 2 = 20

Therefore The correct answer is 20.

Additional Information

Mean

The mean is the arithmetic average of all observations. Formula: Mean = Sum of all observations ÷ Total number of observations.

Mode

The mode is the value that appears most frequently in a data set. A set may have one mode, multiple modes, or no mode at all.

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Median for Odd Data Set

If the total number of observations (N) is odd, the median is exactly the middle value. Formula: Median = [(N + 1) ÷ 2]^(th) term.

Range

The range represents the difference between the highest and lowest values in a data set. Formula: Range = Maximum value − Minimum value.

**Q2. Answer: (b) 793**

Calculation:

=> (32)3+ (23)2.

=> $9^3 + 8^2$

=> 729 + 64

=> 793

Therefore Option 2 is the correct answer.

**Q3. Answer: (d) Khasi Hills**

The correct answer is Khasi Hills.

Key Points

• Mawsynram is situated in the Khasi Hills of Meghalaya, India, known for receiving the highest annual rainfall on Earth.

• The unique topographical features of the Khasi Hills enhance the orographic lifting of monsoon clouds, leading to extremely high rainfall.

Additional Information

| Location | Description |
|---|---|
| Mahadeo Hills | These hills are part of the Satpura range in central India, characterized by dense forests and a rich diversity of wildlife. |
| Lushai Hills | Part of the Mizoram state in Northeast India, these hills are noted for their scenic beauty and are part of the larger Patkai range that extends into Myanmar. |
| Rajmahal Hills | These hills are located in the eastern region of Jharkhand and are known for their historical significance and rich coal deposits. |

**Q4. Answer: (b) 12%**

Shortcut Trick

Salary Ratio (Last Year : This Year) = 34500 : 38640 = 3450 : 3864

Divide both by 345 => 10 : 11.2

Increase = 1.2 units on base 10

Percentage Increase = (1.2 ÷ 10) × 100 = 12%

Therefore The correct answer is 12%.

Alternate Method

Given:

Monthly Salary (Last Year) = Rs. 34,500

Monthly Salary (This Year) = Rs. 38,640

Formula Used:

Percentage Increase = [(New Value − Old Value) ÷ Old Value] × 100

Calculations:

=> Increase in Salary = Rs. 38,640 − Rs. 34,500

=> Increase in Salary = Rs. 4,140

=> Percentage Increase = (4,140 ÷ 34,500) × 100

=> Percentage Increase = 414000 ÷ 34500

=> Percentage Increase = 414 ÷ 34.5 = 12%

Therefore The correct answer is 12%.

Additional Information

Percentage Change

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It measures the degree of change over time. Formula: (Change / Initial Value) × 100.

Successive Percentage Increase

If a value increases by a% and then by b%, the effective increase is [a + b + (ab/100)]%.

Base Change Rule

If A is x% more than B, then B is [x / (100 + x)] × 100% less than A.

**Q5. Answer: (b) Indore**

The correct answer is Indore.

Key Points

• GAIL (India) Limited initiated India's first project for blending hydrogen into the natural gas system at Indore, Madhya Pradesh, in January 2022.

• This pioneering project aims to explore the possibilities of using hydrogen-blended natural gas as a cleaner fuel option, contributing to reducing carbon emissions.

• The initiative is part of India's broader commitment to increase the use of clean energy sources and move towards achieving its climate goals.

• Blending hydrogen with natural gas can significantly lower the amount of carbon dioxide released when the gas is used for energy.

• Such projects are essential for advancing hydrogen technology and infrastructure, paving the way for a sustainable energy future.

Additional Information

• Hydrogen Energy is considered a key component in the global transition towards cleaner energy sources.

• It can be produced from various domestic resources, such as natural gas, nuclear power, biomass, and renewable power like solar and wind.

• There are different types of hydrogen, categorized by their production method: green (from renewable sources), blue (from natural gas with carbon capture), and grey (from natural gas without carbon capture).

• Green hydrogen is the focus of many new projects due to its potential for zero carbon emissions.

• India's National Hydrogen Mission aims to make the country a global hub for the production and export of green hydrogen.

**Q6. Answer: (c) 100 m, South**

Given:

To reach point B from point A, Anita must walk 70 m towards the west,

then she must take a right turn and walk 70 m,

then she must take a left turn and walk 150 m,

then she must take a left turn and walk 70 m,

then she must take a left turn and walk 90 m,

then she must take a right turn and walk 100 m,

and finally she must take a left turn and walk 130 m.

So, point B is 100 m in the South from point A.

Hence, the correct answer is "Option 3".

**Q7. Answer: (b) 301**

The logic followed here is:

So, '301' will replace the question mark in the given series.

Hence, the correct answer is "Option 2".

**Q8. Answer: (a) Only conclusion III follows**

Given Statements:

All phones are tablets.

No tablet is a calculator.

All drives are calculators.

The least possible Venn diagram for the given statement is:

Conclusions:

I. Some drives are phones - False (Because, All phones comes under tablets and all drives is comes under calculators, Therefore, no tablets are calculators gives no phones will be drives).

II. Some calculators are phones - False (Because, All phones comes under tablets and no tablets are calculators, so no

calculators will be phones).

III. No tablet is a drive - True (Because, all drives is comes under calculators and no tablets are calculators. So, no tablets is a drives).

So, Only conclusion III follows.

Hence, the correct answer is "Option 1".

**Q9. Answer: (c) Only iii**

The correct answer is 1) i, ii, iii. This question pertains to the reasons why scientists felt the need to classify elements. The classification of elements was driven by several factors, all aimed at understanding elements better and organizing them in a manner that reflects their properties and relationships. Let's delve into each of the stated reasons:

Key Points

• Different methods of synthesis of elements (i): This refers to the various ways elements can be created or isolated. The method of synthesis can affect an element's purity, form, and availability. Understanding these methods can help scientists in categorizing elements based on their reactivity and the complexity of their isolation.

• Different sources of elements (ii): Elements are derived from various sources, including the Earth's crust, meteorites, and atmospheric gases. The source of an element can influence its abundance, which in turn affects its classification and utility.

• Different properties of elements (iii): The most critical factor for the classification of elements is their properties. Elements exhibit a wide range of physical and chemical properties. Organizing elements based on their properties helps in understanding their behavior and the way they interact with other elements.

Hence, the Statement 1 is correct. All three factors—different methods of synthesis, different sources, and different properties—collectively led scientists towards the classification of elements. This classification has enabled a more systematic study and application of elements across various fields of science and industry. For Additional Information:

The correct answer is option 4

**Q10. Answer: (c) R3 < R1 < R2**

The correct answer is R3 < R1 < R2.

Key Points

The I-V graph displays the current (I) versus voltage (V) relationships for three resistors: R1, R2, and R3. By analyzing the slopes of these lines, we can determine the relative magnitudes of the resistances.

• R3 has the steepest slope, indicating the lowest resistance.

• R1 has a less steep slope than R3 but is steeper than R2, indicating a middle-level resistance.

• R2 has the least steep slope, indicating the highest resistance.

Therefore, the correct relationship between the resistances based on their slopes in the graph is: R3 < R1 < R2

**Q11. Answer: (d) 1956**

The correct answer is 1956.

Key Points

• Bharat Heavy Electricals Limited (BHEL) was initially registered under the name Heavy Electricals (India) Limited (HE(I)L) in 1956.

• It falls under the Ministry of Heavy Industries and Public Enterprises.

• BHEL is India's largest power generation equipment manufacturer, contributing significantly to the country's power sector.

• It has been instrumental in India's industrial development, supplying over 180 power generating sets to utilities, which is a significant share of the total installed capacity.

• BHEL has also established a strong presence in the international market, exporting its products and services to more than 80 countries.

Additional Information

| Aspect | Description |
|---|---|
| Establishment | BHEL was established in 1956, marking the beginning of heavy electrical equipment manufacturing in India. |
| Products and Services | It manufactures and supplies a wide range of products including turbines, generators, boilers, and electric motors. |
| Research and Development | BHEL has a strong focus on R&D to innovate and improve its offerings, maintaining its competitive edge. |

| | |
|---|---|
| Global Presence | It has a global footprint with exports to various countries, contributing to India's export strength in heavy electricals. |
| Sustainability | BHEL is committed to sustainable development and has undertaken various initiatives to reduce its environmental impact. |

**Q12. Answer: (a) Bile salts breaking large fat globules into smaller ones**

The correct answer is Bile salts breaking large fat globules into smaller ones.

Key Points

• Bile salts are produced by the liver and stored in the gallbladder. They play a crucial role in the digestion and absorption of fats.

• The emulsifying action of bile salts on fats is similar to how soaps clean dirt by breaking down large fat droplets into smaller, more manageable pieces.

• This process increases the surface area of fats, making them more accessible to digestive enzymes like lipase for further breakdown.

• Without the action of bile salts, fat digestion and absorption would be significantly less efficient in the human body.

Additional Information

| Term | Description |
|---|---|
| Liver | The largest internal organ in the human body, responsible for producing bile, among other functions such as detoxification and protein synthesis. |
| Gallbladder | A small organ where bile is stored and concentrated before it is released into the small intestine. |
| Fats | Macronutrients that are essential for the body, providing energy and supporting cell growth. They need to be broken down into fatty acids and glycerol for absorption. |
| Digestive enzymes | Proteins that speed up the breakdown of food into nutrients, allowing them to be absorbed into the blood. |
| Lipase | An enzyme that specifically breaks down fats into fatty acids and glycerol. |

**Q13. Answer: (b) R/2**

The correct answer is R/2.

Key Points

• The distance between the focus and the centre of curvature of a spherical mirror is half the radius of curvature, which is R/2.

• The radius of curvature (R) is the radius of the sphere from which the spherical mirror is made.

• The centre of curvature is the center of the sphere from which the mirror is derived, lying on the mirror's principal axis.

• The focus is the point on the principal axis of the mirror where parallel rays converge (concave mirror) or appear to diverge from (convex mirror) after reflection.

Additional Information

• Spherical mirrors are of two types: concave and convex. Concave mirrors converge light rays, while convex mirrors diverge them.

• The principal axis is an imaginary line that passes through the pole (the midpoint of the mirror) and the centre of curvature.

• The focal length (f) of a spherical mirror is the distance between the pole and the focus. It is equal to half the radius of curvature, i.e., f = R/2.

• The mirror equation, 1/f=1/v+1/u, relates the object distance (u), the image distance (v), and the focal length (f), showcasing the relationship between these distances in spherical mirrors.=1v+1u1f=1v+11f=1v+1

**Q14. Answer: (a) S**

Given: Seven friends, P, Q, R, S, T, U and V, are sitting around a circular table. All are facing the centre of the table.

1) V is third to the left of U.

2) V is sitting third to the right of Q.

3) Only R is sitting between Q and S.

4) Only T is sitting between P and V.

So, 'S' is sitting to the immediate right of R.

Hence, the correct answer is "Option 1".

**Q15. Answer: (c) Neither conclusion 1 nor 2 is true**

Given Statement: Z > R ≥ Y > P = Q ≤ N < S

Now,

Conclusions:

(i) P > S → False (P = Q ≤ N < S It gives P < S)

(ii) Z < Q → False (Z > R ≥ Y > P = Q It gives Z > Q)

Here, Neither conclusion 1 nor 2 is true.

Hence, the correct answer is "Option 3".

**Q16. Answer: (a) 13.33%**

Calculation:

=> Score by A = 45 + 50 + 75 = 170

=> Score by C = 40 + 45 + 65 = 150

=> Difference = 170 - 150 = 20

=> % = 20/ 150 × 100 = 40/3 = 13.33%

Therefore Option 1 is the correct answer.

**Q17. Answer: (b) 25%**

Calculation:

Total policy sold = 128 + 165 + 136+ 111 + 120 = 660

According to the question:

=> 165/660 × 100 = 25%

Therefore Option 2 is the correct answer.

**Q18. Answer: (b) calcium oxychloride**

The correct answer is Calcium oxychloride.

Key Points

• The chemical formula for calcium oxychloride(Bleaching powder) is CaOCl2, but the actual composition is quite complex.

• Bleaching powder is formed when dry-slaked lime reacts with chlorine.

• Ca(OH)2(s) + Cl2(g) → CaOCl2 + H2O.

• Ca(OH)2 is the molecular formula for calcium hydroxide. It has a white colour and is formed when calcium oxide dissolves in water.

• During the electrolysis of aqueous sodium chloride, chlorine is produced (brine).

• This chlorine gas is used in the production of bleaching powder.

• Thus, bleaching powder is produced by the action of chlorine on dry-slaked lime.

• Additional Information

• Uses of calcium oxychloride(Bleaching powder)

• Bleaching cotton and linen in the textile industry,

• Bleaching wood pulp in paper mills,

• And bleaching washed clothes in laundries;

• As an oxidising agent in many chemical industries; and disinfecting drinking water.

• Killing weeds in Homes.

**Q19. Answer: (c) FLOWER : OLFREW**

The logic followed here is:

For, COWBOY : WOCYOB

For, TANGLE : NATELG

Similarly, for FLOWER : OLFREW

Hence, the correct answer is "Option 3".

**Q20. Answer: (c) Scheme 2**

Shortcut Trick

Scheme 1 Discount % = (3 ÷ 8) × 100 = 37.5%.

Scheme 2 Discount % = (6 ÷ 11) × 100 ≈ 54.54%.

Scheme 3 Discount % = 10 + 5 − (10 × 5 ÷ 100) = 14.5%.

Comparing all three, Scheme 2 offers the highest discount percentage.

Higher discount is always most beneficial for the customer.

Therefore The correct answer is Scheme 2.

Alternate Method

Given → Scheme 1 (Buy 5 Get 3), Scheme 2 (Buy 5 Get 6), Scheme 3 (10% + 5% successive).

Formulas: Discount% = (Free Items ÷ Total Items) × 100 | Successive = a + b − ab ÷ 100.

=> Scheme 1: Total items = 5 + 3 = 8. Discount = 3. % = (3 ÷ 8) × 100 = 37.5%.

=> Scheme 2: Total items = 5 + 6 = 11. Discount = 6. % = (6 ÷ 11) × 100 = 54.54%.

=> Scheme 3: Successive discount = 10 + 5 − (10 × 5) ÷ 100 = 15 − 0.5 = 14.5%.

=> Comparing 37.5%, 54.54%, and 14.5%, the maximum is 54.54%.

Therefore The correct answer is Scheme 2.

Additional Information

Buy X Get Y Free Concept

In this type of offer, the discount percentage is calculated on the total number of articles (Paid + Free). Formula: Discount% = [Y ÷ (X + Y)] × 100.

Successive Discounts

When two discounts 'a' and 'b' are given, the single equivalent discount is less than the sum of individual percentages due to the formula a + b − (ab/100).

**Q21. Answer: (a) 131^(st)**

The correct answer is 131st.

Key Points

• The Human Development Index (HDI) is a measure of a country's health, education, and standard of living.

• India's ranking of 131st in 2020 indicates its position relative to other countries in terms of human development.

• The HDI is prepared annually by the United Nations Development Programme (UNDP).

• The index considers three dimensions: life expectancy, education (mean years of schooling and expected years of schooling), and per capita income.

• The HDI is used to classify countries into four tiers of human development: very high, high, medium, and low.

Additional Information

• The United Nations Development Programme (UNDP) was established in 1965.

• It aims to eradicate poverty while protecting the planet, creating sustainable development across the globe.

• The UNDP publishes the Human Development Report annually, providing a comprehensive overview of the state of the world's development.

• The concept of human development, as introduced by the UNDP, emphasizes that economic growth alone is not sufficient to measure a country's development.

• Amartya Sen, a Nobel laureate in economics, played a crucial role in developing the HDI concept.

**Q22. Answer: (c) (15, 20, 25)**

The logic followed here is:

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

Now,

For, (12, 15, 18)

=> (12 + 18) ÷ 2

=> 30 ÷ 2 = 15.

For, (45, 35, 25)

=> (45 + 25) ÷ 2

=> 70 ÷ 2 = 35.

Similarly, for (15, 20, 25)

=> (15 + 25) ÷ 2

=> 40 ÷ 2 = 20.

Hence, the correct answer is "Option 3".

**Q23. Answer: (c) Manipur**

The correct answer is Manipur.

Key Points

• The Sangai deer, also known as the Brow-antlered Deer, is an endemic species found exclusively in Manipur, India.

• It is critically endangered and lives in the unique floating habitat of the Keibul Lamjao National Park, the world's only floating national park.

• Their habitat is threatened by human activities and environmental changes, making conservation efforts crucial for their survival.

• The Sangai is an important symbol for Manipur, reflecting the state's rich biodiversity and ecological significance.

Additional Information

| Option | Details |
|---|---|
| Rajasthan | Known for the Thar Desert and its rich cultural heritage, not for Sangai deer. |
| Telangana | Located in southern India, known for its biodiversity but not home to the Sangai deer. |
| Kerala | Known for its backwaters and rich biodiversity, but the Sangai deer is not found here. |

**Q24. Answer: (b) 14/33**

Shortcut Trick

For a mixed recurring decimal like 0.abc...

Fraction = (Full number after decimal − Non-recurring part) ÷ (9 for each recurring digit followed by 0 for each non-recurring digit)

Here, number = 424, non-recurring = 4, recurring digits = 2 (24)

Fraction = (424 − 4) ÷ 990 = 420 ÷ 990 = 42 ÷ 99 = 14 ÷ 33

Therefore The correct answer is 14/33.

Alternate Method

Given: x = 0.424242... (Equation 1)

Calculations:

=> Multiply (Equation 1) by 10: 10x = 4.242424... (Equation 2)

=> Multiply (Equation 1) by 1000: 1000x = 424.242424... (Equation 3)

=> Subtract (Equation 2) from (Equation 3):

=> 1000x − 10x = 424.242424... − 4.242424...

=> 990x = 420

=> x = 420 ÷ 990

=> x = 42 ÷ 99 = 14 ÷ 33

Therefore The correct answer is 14/33.

Additional Information

Pure Recurring Decimals

If all digits after the decimal point repeat, the denominator consists only of 9s (e.g., 0.33... = 3/9 = 1/3).

Mixed Recurring Decimals

If some digits do not repeat, the denominator has 9s for repeating digits followed by 0s for non-repeating digits.

Rational Numbers

Every terminating or recurring decimal can be expressed in the p/q form, making it a Rational Number.

**Q25. Answer: (b) Potato juice contains starch, which turns blue black with iodine**

The correct answer is potato juice contains starch, which turns blue black with iodine.

Key Points

Starch Reaction with Iodine:

• Starch is a complex carbohydrate which reacts with iodine to form a blue-black color.

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• The presence of starch in substances like potato juice can be confirmed by adding iodine, which results in this characteristic color change.

• This reaction is commonly used as a simple test to detect starch in various materials and food products.

• When iodine is added to potato juice, it interacts with the starch molecules to create a visible blue-black complex.

• This test is an essential diagnostic tool in laboratories for identifying starch presence in samples.

Thus, the blue-black color in potato juice when iodine is added is due to the presence of starch.

Additional Information

Starch:

• Starch is a polysaccharide comprising glucose monomers and is a major part of the human diet.

• Plants store glucose as starch in their roots and seeds, which is later broken down by humans and other animals for energy.

• Starch in plants is generally stored in structures known as granules, occurring in different shapes and sizes depending on the species.

**Q26. Answer: (b) 169**

The logic followed here is:

So, '169' will replace the question mark in the given series.

Hence, the correct answer is "Option 2".

**Q27. Answer: (c) 420**

Shortcut Trick

To find the smaller part when the sum and difference are known:

Smaller Part = (Sum − Difference) ÷ 2

=> Pages in second part = (892 − 52) ÷ 2

=> 840 ÷ 2 = 420

Therefore The correct answer is 420 pages.

Alternate Method

Given:

Total pages in textbook = 892

Difference between first part and second part = 52

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

Then, the number of pages in the first part = x + 52

=> Total pages = First part + Second part

=> 892 = (x + 52) + x

=> 892 = 2x + 52

=> 2x = 892 − 52

=> 2x = 840

=> x = 840 ÷ 2

=> x = 420

Therefore The correct answer is 420 pages.

Additional Information

Sum and Difference Rule

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

Linear Equations in One Variable

A linear equation is an algebraic equation where each term has an exponent of 1, and when solved, it provides a unique value for the variable.

Verification

First part = 420 + 52 = 472. Total = 472 + 420 = 892. This confirms the calculation is correct.

**Q28. Answer: (c) E. coli Coliform**

The Correct answer is E.coli Coliform.

Key Points

• E. coli Coliform bacteria serve as an essential indicator of water pollution.

• When the coliform count in water is high, it signifies a significant level of fecal matter.
• These bacteria originate from soil, vegetation, and the intestinal tracts of warm-blooded animals.
• Thus, their presence indicates potential water pollution.
• Faecal coliform is a faculatively anaaerobic, rod shaped, gram -negative, non- sporulating bacterium.
• So, the presence of high coliform counters in water indicates contamination by human wastes.

Additional Information

• Salmonella enterica serotype Typhi, is a gram-negative bacterium responsible for causing typhoid fever in humans.
• Typhoid fever, also called enteric fever, stems from infection with Salmonella enterica serotype Typhi (commonly referred to as Salmonella Typhi).
• Vibrio cholerae, a gram-negative bacterium, indeed plays a significant role in the development of cholera.
• This waterborne pathogen produces a potent toxin that leads to severe diarrhea and dehydration.
• Mycobacterium tuberculosis, also known as Koch's bacillus, is a species of pathogenic bacteria in the family Mycobacteriaceae. It serves as the causative agent of tuberculosis.

**Q29. Answer: (c) Stomata**

The Correct answer is Stomata.

Key Points

• Stomata are tiny openings or pores found in the epidermis of leaves and young stems. These specialized structures play a crucial role in gas exchange within plants.
• Stomata allow the exchange of gases (such as oxygen and carbon dioxide) between the internal air spaces of the leaf and the atmosphere.
• Each stoma consists of a minute pore called a stoma, which is surrounded by a pair of guard cells.
• The cell wall surrounding the pore is tough and flexible.
• Guard cells are bean-shaped and contain chloroplasts with chlorophyll, allowing them to capture light energy.
• Subsidiary cells surround the guard cells. They act as accessory cells and protect the epidermal cells when the guard cells expand during stomatal opening.
• Carbon dioxide enters the leaf through stomata, which is essential for photosynthesis.

Additional Information

• The cell membrane, also known as the plasma membrane, is a thin barrier that surrounds every living cell.
• The plasma membrane controls the movement of solutes and solvents between the cell and its environment.
• The cell membrane keeps the cell's constituents inside and prevents unwanted substances from entering.
• The nucleus is a pivotal organelle found in eukaryotic cells. It serves as the cell's control center, regulating almost all forms of cellular activities.

**Q30. Answer: (a) S**

The correct answer is S.

Key Points

• Sulfur (S) typically exists in a molecular form as S8, which means each molecule of sulfur consists of 8 sulfur atoms.
• Phosphorus (P) can exist in several forms, with the most common being P4, meaning each molecule consists of 4 phosphorus atoms.
• Argon (Ar) and Neon (Ne) are noble gases, existing as monoatomic gases under standard conditions, meaning they are not bonded to other atoms in their elemental form.
• Given these facts, sulfur has the maximum number of atoms in its molecular form compared to the other elements listed.

Additional Information

| Element | Details |
|---|---|
| S | Sulfur molecules are typically octatomic, with the formula S8. |
| P | Phosphorus most commonly exists as tetraatomic molecules, P4. |
| Ar | Argon is a noble gas that exists as monoatomic particles, Ar. |
| Ne | Neon is another noble gas, existing as monoatomic particles, Ne. |

**Q31. Answer: (c) 3 : 4**

Shortcut Trick

According to the Intercept Theorem (or Thales's Theorem for parallel lines), if three or more parallel lines are cut by two transversals, then they cut off the transversals proportionally.

Therefore, the ratio of the intercepts made by the second transversal is always equal to the ratio of the intercepts made by the first transversal.

Given ratio of intercepts on the first transversal = 3 : 4

Hence, the ratio of intercepts on the second transversal = 3 : 4

Therefore The correct answer is 3 : 4.

Alternate Method

Given:

Three parallel lines L1, L2, and L3 are intersected by two transversals T1 and T2.

The intercepts made by the first transversal T1 are AB and BC, such that AB : BC = 3 : 4.

Theorem Used:

Three Parallel Lines Theorem (Intercept Theorem): If three parallel lines intersect two transversals, then they divide the transversals proportionally.

Mathematically, if L1 || L2 || L3, then:

AB ÷ BC = DE ÷ EF

Calculations:

Let the first transversal T1 intersect the parallel lines L1, L2, and L3 at points A, B, and C respectively.

Let the second transversal T2 intersect the parallel lines L1, L2, and L3 at points D, E, and F respectively.

=> The intercepts made by T1 are AB and BC.

=> The intercepts made by T2 are DE and EF.

According to the Intercept Theorem, since L1 || L2 || L3:

=> AB ÷ BC = DE ÷ EF

Given that the ratio of the intercepts made by the first transversal is 3 : 4:

=> AB : BC = 3 : 4

=> AB ÷ BC = 3 ÷ 4

Substituting this into the theorem's equation:

=> DE ÷ EF = 3 ÷ 4

=> DE : EF = 3 : 4

Thus, the intercepts made by the second transversal are also in the ratio 3 : 4.

Explanation of Options:

=> Option (1) 2 : 4: Incorrect, as the ratio of the intercepts must be exactly equal to 3 : 4, whereas 2 : 4 simplifies to 1 : 2.

=> Option (2) 1 : 1: Incorrect, as this would only be true if the parallel lines were equally spaced and the first ratio was 1 : 1.

=> Option (3) 3 : 4: Correct, as the Intercept Theorem guarantees that the ratio of the intercepts on any transversal cut by the same parallel lines remains constant at 3 : 4.

=> Option (4) 4 : 3: Incorrect, as this is the reciprocal ratio and does not maintain the correct order of corresponding segments from top to bottom.

Therefore The correct answer is 3 : 4.

Additional Information

Intercept Theorem (Thales's Theorem)

If two transversals intersect any number of parallel lines, then the ratio of the intercepted segments on one transversal is equal to the ratio of the corresponding segments on the other transversal.

Basic Proportionality Theorem (BPT)

In a triangle, a line drawn parallel to one side intersecting the other two sides divides them in the same ratio. This is a special case of the intercept theorem where the two transversals meet at a vertex.

Midpoint Theorem

The line segment connecting the midpoints of two sides of a triangle is parallel to the third side and is half of its length, which is a direct consequence of the proportionality of intercepts when the ratio is 1 : 1.

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**Q32. Answer: (c) JLFPAHD**

Given:

| Number/ symbol | 9 | 5 | 3 | # | 6 | & | 7 | @ | % | 8 | 2 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Code | L | K | J | H | G | F | D | S | A | P | B |

| Conditions | Coded As |
|---|---|
| First two elements are numbers and the last is a symbol | Codes for these two (second number and the last symbol) are to be interchanged |
| Second element is a symbol and the last is a symbol | All the symbols are to be coded as C |
| Any number which is immediately preceded by a prime number | Codes for these two (first and last number) are to be interchanged |

Now, the group of numbers and symbols is: 7 9 & 8 % # 3

Here, Third conditions followed in the given group,

So, codes of the first and last number appearing in the question.

Then, the code for '7 9 & 8 % # 3' is → 'J L F P A H D'.

Hence, the correct answer is "Option 3".

**Q33. Answer: (d) 6, 12, 18**

The correct answer is 6, 12, 18.

Key Points

• Cyclohexane, with the molecular formula C6H12, has a ring structure formed by six carbon atoms.

• C-C bonds: Each carbon atom is connected to two neighboring carbon atoms in the hexagonal ring. Since there are six carbon atoms, there are six C-C bonds.

• C-H bonds: Each carbon atom is also bonded to two hydrogen atoms. Since there are six carbon atoms, there are twelve C-H bonds.

• Structure: Cyclohexane is a cyclic hydrocarbon with the chemical formula C6H12. It forms a six-membered ring composed of carbon atoms.

• Shape: The cyclohexane ring adopts a chair conformation, which minimizes steric strain between adjacent hydrogen atoms.

• Isomerism: There are two possible isomers of cyclohexane: cis-cyclohexane and trans-cyclohexane. In the chair conformation, these isomers differ in the relative positions of substituents.

• Stability: The chair conformation is more stable than the boat conformation due to fewer eclipsing interactions.

Additional Information

• Application: Cyclohexane is commonly used as a nonpolar solvent in chemical reactions and extractions.

• It serves as a starting material for the synthesis of various organic compounds.

• It is a precursor in the production of nylon and other polymers.

• Safety: Cyclohexane is flammable and should be handled with care.

**Q34. Answer: (d) Both (i) and (ii)**

The correct answer is Both (i) and (ii).

Key Points

Soft Iron Core:

• The soft iron core is a crucial part of the armature.

• It provides a low-reluctance path for the magnetic flux generated by the field windings (stator).

• The core enhances the magnetic field strength within the armature, leading to efficient energy conversion.

• Soft iron is preferred because it has high permeability and low hysteresis losses.

Coil:

• The coil refers to the armature winding.

• It consists of multiple turns of insulated wire wound around the core slots.

• When current flows through the coil, it generates a magnetic field.

• The interaction between this magnetic field and the stator field results in the motor's rotation.

Additional Information

• While the permanent magnets are not part of the armature itself, they play a crucial role in some types of electric motors.

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• In brushless DC motors and some other designs, permanent magnets are placed on the rotor (which is equivalent to the armature).

• These magnets create a fixed magnetic field, and the armature winding interacts with it to produce motion.

• In other motor types (such as brushed DC motors), the stator contains field windings instead of permanent magnets.

**Q35. Answer: (d) 4**

Given terms: # 9 1 @ 4 * 7 ^ 5 3 # 9 1 < 5 4 @ 3 $ # 2 * 6 ! 4 2 & 9 < 3 6 # 2 % 2 @ 7

If even numbers in the given series are replaced with a number which is prime as well as even number,

As we know, 2 is the only number which is prime as well as even number.

So, the series will be: # 9 1 @ 2 * 7 ^ 5 3 # 9 1 < 5 2 @ 3 $ # 2 * 2 ! 2 2 & 9 < 3 2 # 2 % 2 @ 7

After formed the new series, immediately preceded by a prime number and immediately followed by a symbol is:

So, the required pair is: Prime number - Number - Symbol

Here, total '4 pairs' having the numbers which are immediately preceded by a prime number and immediately followed by a symbol.

Hence, the correct answer is "Option 4".

**Q36. Answer: (c) Narmada**

The correct answer is Narmada.

Key Points

• Narmada River originates from the Amarkantak Hills in the Anuppur district of Madhya Pradesh.

• It is one of the most important rivers in India, flowing towards the west and draining into the Arabian Sea.

• The Narmada basin is bounded by the Vindhya and Satpura ranges in the north and south, respectively.

• It is known for the Narmada Valley project, which is a large-scale river development scheme.

Additional Information

| River | Details |
|---|---|
| Teesta | Flows through Sikkim and West Bengal into Bangladesh. |
| Sutlej | Originates near Lake Rakshastal in Tibet and enters India in Himachal Pradesh. |
| Godavari | Originates from Trimbakeshwar, Maharashtra, and is the second longest river in India. |

**Q37. Answer: (a) 36**

The logic followed here is:

Logic: (Sum of the place value of all numbers) + 6 = Code of the word.

'FUEL' is written as '50'

=> (6 + 21 + 5 + 12) + 6

=> 44 + 6 = 50.

'JEER' is written as '44'

=> (10 + 5 + 5 + 18) + 6

=> 38 + 6 = 44.

Similarly, for 'FARE'

=> (6 + 1 + 18 + 5) + 6

=> 30 + 6 = 36.

So, 'FARE' will be written as '36'.

Hence, the correct answer is "Option 1".

**Q38. Answer: (d) 1/3**

The correct answer is 1/3.

Key Points

• The question regarding the fraction of positions reserved for women in all panchayat institutions seems to have an error in the options provided as they are dates rather than fractions or percentages.

• In reality, at least one-third (33.33%) of the seats in all panchayat institutions are reserved for women. This reservation includes the positions of chairpersons in panchayats at all levels.

• This reservation policy for women is aimed at empowering them and ensuring their active participation in grassroots-level governance.

• The policy is a significant step towards gender equality and strengthens the role of women in decision-making processes at the village level.

Additional Information

| Keyword | Description |
|---|---|
| Panchayat | A form of local self-government in villages and small towns. It is the decision-making body at the grassroots level in India. |
| Women's Reservation | A policy to reserve a minimum number of positions for women to ensure their participation in governance and decision-making processes. |
| Local Governance | The management and administration of local affairs by elected representatives at the village, town, or district level. |
| Empowerment | The process of increasing the capacity of individuals or groups to make choices and to transform those choices into desired actions and outcomes. |
| Gender Equality | The state in which access to rights or opportunities is unaffected by gender. |

**Q39. Answer: (d) 31**

Given Equation: 16 + 4 - 8 ÷ 3 × 2 = ?

BODMAS Rule:

Decoding the given information:

| Alphabet | • | • | × | ÷ |
|---|---|---|---|---|
| Meaning | ÷ | × | • | • |

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

=> 16 ÷ 4 × 8 - 3 + 2 = ?

=> 4 × 8 - 3 + 2 = ?

=> 32 - 3 + 2

=> 34 - 3 = 31

Hence, the correct option is "Option 4".

**Q40. Answer: (a) iv**

The correct answer is iv.

Key Points

• A redox reaction involves the transfer of electrons from one substance to another. This includes any chemical reaction in which the oxidation number of a molecule, atom, or ion changes by gaining or losing an electron.

• Statement (i) ZnO + C → Zn + CO represents a redox reaction where ZnO is reduced to Zn and C is oxidized to CO.

• Statement (ii) $MnO_2 + 4HCl \rightarrow MnCl_2 + 2H_2O + Cl_2$ is also a redox reaction, with $MnO_2$ being reduced to $MnCl_2$ and HCl being oxidized to $Cl_2$.

• Statement (iii) $4Na + O_2 \rightarrow 2Na_2O$ is a redox reaction where Na is oxidized to $Na_2O$.

• Statement (iv) $AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$ is not a redox reaction. It is a double displacement or metathesis reaction, where no transfer of electrons occurs between $AgNO_3$ and NaCl; instead, there's a swapping of ions.

Additional Information

• In a double displacement reaction, the anions and cations of two different molecules switch places, forming two entirely different compounds.

• Redox reactions are essential for various biological processes and industrial applications, including energy production, corrosion, and the synthesis of materials.

• The understanding of redox reactions is crucial for fields such as electrochemistry, where these reactions are foundational to the operation of batteries and fuel cells.

Hence, Statement 1 is correct.

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**Q41. Answer: (c) Parsi**

The correct answer is Parsi.

Key Points

• Navroz is the Persian New Year, celebrated by the Parsi community worldwide.

• This festival marks the first day of the first month (Farvardin) in the Iranian calendar.

• It symbolizes the spirit of renewal and is celebrated with various traditions, including cleaning homes, wearing new clothes, and preparing festive meals.

• The celebration of Navroz is also recognized by UNESCO as an Intangible Cultural Heritage of Humanity, highlighting its importance and the cultural diversity it represents.

Additional Information

| Religion | Details |
|---|---|
| Jain | Jainism is an ancient Indian religion known for principles like non-violence and asceticism. |
| Sikh | Sikhism, founded by Guru Nanak in the 15th century, is a monotheistic religion originating in the Punjab region of India. |
| Parsi | The Parsi community follows Zoroastrianism, one of the world's oldest monotheistic religions, founded by Prophet Zoroaster in ancient Iran. |
| Buddhist | Buddhism is a path of practice and spiritual development leading to Insight into the true nature of reality, founded by Siddhartha Gautama. |

**Q42. Answer: (c) Mumbai**

The correct answer is Mumbai.

Key Points

• The Haji Ali Dargah is a famous Islamic shrine located in Mumbai, India.

• It was constructed in 1431 in memory of a wealthy Muslim merchant, Sayyed Peer Haji Ali Shah Bukhari, who gave up all his worldly possessions before making a pilgrimage to Mecca.

• The Dargah is located on an islet off the coast of Worli in the southern part of Mumbai.

• Accessible only during low tide through a 500-yard-long causeway, it is a prominent landmark and an iconic symbol of Mumbai.

• The shrine is visited by people of all religions, symbolizing the secular ethos of India.

Additional Information

• The architecture of Haji Ali Dargah is a blend of Indo-Islamic architectural styles, featuring a white dome and minarets that are recognizable from a distance.

• The site also contains the tomb of Sayyed Peer Haji Ali Shah Bukhari, around which the entire complex is built.

• It is also known for its Qawwali sessions on Fridays, which attract a large number of devotees and music enthusiasts.

• The Dargah is not only a religious site but also a place of great cultural and historical significance in Mumbai.

**Q43. Answer: (d) Statement - II is true, and Statement - I is false.**

The correct answer is Statement - II is true, and Statement - I is false.

Key Points

Statement - I: Anhydrous sodium carbonate is used in soda-acid fire extinguishers.

• Soda-acid fire extinguishers primarily use sodium bicarbonate ($NaHCO_3$), not anhydrous sodium carbonate ($Na_2CO_3$).

• The reaction in a soda-acid fire extinguisher involves sodium bicarbonate reacting with an acid (like sulfuric acid) to produce carbon dioxide gas, which then smothers the fire.

• Anhydrous sodium carbonate, while it is a base, is not the active ingredient for $CO_2$ generation in these extinguishers.

Therefore, Statement - I is incorrect.

Statement - II: Anhydrous sodium carbonate is dissolved in water and recrystallized to get washing soda crystals containing 10 molecules of water of crystallisation.

• Anhydrous sodium carbonate is also known as soda ash.

• Washing soda is the common name for sodium carbonate decahydrate, which has the chemical formula $Na_2CO_3 \cdot 10H_2O$.

• This hydrated form is indeed obtained by dissolving anhydrous sodium carbonate in water and then allowing it to crystallize, which incorporates 10 molecules of water into its crystal structure for every molecule of sodium carbonate.

Therefore, Statement - II is correct.

Additional Information

• Anhydrous Sodium Carbonate:

• Anhydrous sodium carbonate (Na2CO3) is used in various industrial applications, including as a mild base in fire extinguishers.

• In soda-acid fire extinguishers, it neutralizes the acid and helps in extinguishing the fire.

• Washing Soda:

• Washing soda, also known as sodium carbonate decahydrate (Na2CO3·10H2O), is produced by recrystallizing sodium carbonate from a solution that absorbs 10 molecules of water for each formula unit of sodium carbonate.

• It is commonly used as a cleaning agent and in the manufacture of glass.

• Recrystallization Process:

• The process of recrystallizing sodium carbonate involves dissolving anhydrous sodium carbonate in water and allowing it to crystallize, forming washing soda with water of crystallization.

**Q44. Answer: (a) 4**

The logic followed here is:

Given number: 34135278.

Odd digits is decreased by + 2

and, Even digits is increased by - 1

After arrange the numbers:

34135278 => 53357197

Now, The third digits from the left after rearranging the series: 3

And, The third digits from the right after rearranging the series: 1

So, the sum of the digits that are third from the left and third from the right: 3 + 1 = 4.

Hence, the correct answer is "Option 1".

**Q45. Answer: (a) Part IV-A**

The correct answer is Part IV-A.

Key Points

• Article 51A was added to the Constitution of India by the 42nd Amendment Act in 1976.

• It outlines the 11 Fundamental Duties of the citizens of India, emphasizing a commitment to the Constitution, respect for national symbols, and the upholding of unity and integrity of the country.

• Part IV-A of the Constitution, which contains only one Article (51-A), specifically addresses these duties.

• These duties are non-justiciable in nature, meaning they are not enforceable by the courts for their violation.

Additional Information

| Part | Details |
|---|---|
| Part IV-A | Contains Article 51-A, detailing the Fundamental Duties of citizens. |
| Part V | Covers the Union Government, including the President, Vice-President, and the Council of Ministers. |
| Part IXA | Deals with Municipalities, added by the 74th Amendment Act of 1992. |
| Part VII | Originally, it dealt with the States in Part B of the First Schedule, but was repealed by the 7th Amendment Act, 1956. |

**Q46. Answer: (a) COA - 79**

The logic followed here is:

"

So, 'COA - 79' will replace the question mark in the given series.

Hence, the correct answer is "Option 1".

**Q47. Answer: (c) 3**

Given : (Left) 3 ^ % 7 2 4 £ 3 ¥ 4 ρ @ 8 8 & 6 @ 1 (Right)

Numbers which is immediately followed by a symbol and also immediately preceded by a symbol:

So, the pattern needed is: Symbol - Number - Symbol

Now,

So, there are '3' such numbers which is immediately followed by a symbol and also immediately preceded by a symbol.

Hence, the correct answer is "Option 3".

**Q48. Answer: (b) 42.17**

Shortcut Trick

Net deviation in sum = Correct value − Misread value = 47 − 41 = +6.

Average deviation = Net deviation ÷ Total numbers = 6 ÷ 36 = 1/6 ≈ 0.166...

Correct Mean = Old Mean + Average deviation = 42 + 0.166... = 42.166...

Rounding to two decimal places, we get 42.17.

Therefore The correct answer is 42.17.

Alternate Method

Given: Total numbers (n) = 36, Initial Mean = 42, Correct value = 47, Misread value = 41.

Formula Used: Correct Mean = [(Old Mean × n) − Misread Value + Correct Value] ÷ n

=> Initial Total Sum = 36 × 42 = 1512

=> Correct Total Sum = 1512 − 41 + 47 = 1518

=> Correct Mean = 1518 ÷ 36

=> Correct Mean = 42.1666...

=> Correct Mean ≈ 42.17

Therefore The correct answer is 42.17.

Additional Information

Arithmetic Mean Formula

The mean of n observations is calculated as Mean = (Σx_i) ÷ n, where Σx_i is the sum of all observations.

Property of Linear Change

If every observation in a data set is increased by a constant k, the mean also increases by k. Similarly, if the total sum changes by S, the mean changes by S/n.

Weighted Average

When two groups with means m1 and m2 and sizes n1 and n2 are combined, the new mean is (n1m1 + n2m2) ÷ (n1 + n2).

**Q49. Answer: (c) 211 and 178, respectively**

According to the given Venn diagram:

the rectangle represents students,

the circle represents girls,

the oval represents arts stream,

and the triangle represents sports.

The shaded area shows the "total number of girl students have taken arts stream and do NOT play sports".

The shaded area shows the "total number of students who play sports but are NOT girls, and have taken arts stream".

So, the total number of girl students have taken arts stream and do NOT play sports is: 211

And, the total number of students who play sports but are NOT girls, and have taken arts stream is: 178

Hence, the correct answer is "Option 3".

**Q50. Answer: (a) 21 years**

Shortcut Trick

Ratio of ages A : B : C

Given A = 2B and C = 3B => A : B : C = 2 : 1 : 3

Total ratio parts = 2 + 1 + 3 = 6 units → 42 years

Sum of A and B = 2 + 1 = 3 units → (42 ÷ 6) × 3 = 21 years

Therefore The correct answer is 21 years.

Alternate Method

Given:

Age of A = 2 × Age of B

Age of B = 1/3 × Age of C => Age of C = 3 × Age of B

Sum of ages = 42 years

Let B's age be x

=> A's age = 2x

=> C's age = 3x

=> 2x + x + 3x = 42

=> 6x = 42

=> x = 7

=> Sum of A and B = 2x + x = 3x

=> 3 × 7 = 21 years

Therefore The correct answer is 21 years.

Additional Information

Ratio & Proportion in Ages

When ages are linked through multiples, expressing all ages in terms of a single variable (usually the smallest unit) simplifies calculation.

Ages after 'n' years

If current age is x, then age after n years is (x + n) and age n years ago was (x − n).

Difference of Ages

The difference between the ages of two persons remains constant throughout their lives, regardless of the number of years passed.

**Q51. Answer: (d) 1 : 1**

Shortcut Trick

Identify complementary angles: 22° + 68° = 90° and 33° + 57° = 90°.

Apply rule: If A + B = 90°, then $\sin^2 A + \sin^2 B = 1$ and $\cos^2 A + \cos^2 B = 1$.

Value of Numerator = 1 and Value of Denominator = 1.

The ratio is 1 : 1.

Therefore The correct answer is 1 : 1.

Alternate Method

Given: $\sin^2 22° + \sin^2 68°$ and $\cos^2 33° + \cos^2 57°$

Formula Used: $\sin(90° - \theta) = \cos\theta$ | $\cos(90° - \theta) = \sin\theta$ | $\sin^2\theta + \cos^2\theta = 1$

=> $\sin^2 68° = \sin^2 (90° - 22°) = \cos^2 22°$

=> First part: $\sin^2 22° + \cos^2 22° = 1$

=> $\cos^2 57° = \cos^2 (90° - 33°) = \sin^2 33°$

=> Second part: $\cos^2 33° + \sin^2 33° = 1$

=> Ratio = 1 : 1

Therefore The correct answer is 1 : 1.

Additional Information

Trigonometric Identities

Fundamental identities include $\sin^2\theta + \cos^2\theta = 1$, $1 + \tan^2\theta = \sec^2\theta$, and $1 + \cot^2\theta = \text{cosec}^2\theta$.

Complementary Angle Relations

For any angle θ, $\sin(90° - \theta) = \cos\theta$, $\tan(90° - \theta) = \cot\theta$, and $\sec(90° - \theta) = \text{cosec}\,\theta$.

**Q52. Answer: (b) 192**

Shortcut Trick

Prime factorize the given numbers and the LCM: 96 = 2^5 × $3^1$, 144 = 2^4 × $3^2$, and 576 = 2^6 × $3^2$.

The LCM must contain the highest power of each prime factor present in the numbers.

Since the LCM has 2^6 but 96 and 144 only have up to 2^5, the number x must contribute 2^6 (= 64).

Checking the options, only 192 (64 × 3) contains 2^6 as a factor.

Therefore The correct answer is 192.

Alternate Method

Given: Three numbers 96, 144, and x with their Least Common Multiple (LCM) equal to 576.

Method: Use the Prime Factorization property of LCM.

=> Prime factorization of 96 = 2 × 2 × 2 × 2 × 2 × 3 = 2^5 × $3^1$

=> Prime factorization of 144 = 2 × 2 × 2 × 2 × 3 × 3 = 2^4 × 3²

=> Prime factorization of LCM 576 = 2^6 × 3²

=> For 576 to be the LCM, the maximum power of prime factor 2 across the three numbers must be 2^6.

=> Neither 96 nor 144 has 2^6, so x must have 2^6 as its factor.

=> Let x = 2^6 × 3^k, where k ≤ 2. If k = 1, x = 64 × 3 = 192.

Therefore The correct answer is 192.

Additional Information

LCM (Least Common Multiple)

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

HCF and LCM Relation

For any two numbers a and b, HCF(a, b) × LCM(a, b) = a × b. Note: This specific formula does not apply directly to three or more numbers.

HCF (Highest Common Factor)

The largest positive integer that divides each of the given numbers without leaving a remainder. It is found by taking the lowest power of common prime factors.

**Q53. Answer: (d) East**

Given:

Suneet walked 10 m towards the north,

then he turned left and walked 11 m,

then from there he turned right and walked 13 m,

and then he turned right again and walked 25 m.

So, Suneet is facing now at the 'East' direction.

Hence, the correct answer is "Option 4".

**Q54. Answer: (b) 1910**

The correct answer is 1910.

Key Points

• The Indian Museum Act was passed in the year 1910 to provide for the proper administration and management of the Indian Museum.

• This act facilitated the preservation, development, and display of the rich cultural and natural heritage of India.

• The Indian Museum, located in Kolkata, is the largest and oldest museum in India and is of national importance.

• The act aimed to ensure that the museum's collection is maintained properly, and accessible for public viewing and research.

Additional Information

• The Indian Museum was founded in 1814 by the Asiatic Society of Bengal in Kolkata.

• It is also referred to as the 'Jadughar' and houses rare collections of antiques, armour and ornaments, fossils, skeletons, mummies, and Mughal paintings.

• It has six sections comprising Art, Archaeology, Anthropology, Geology, Zoology, and Economic Botany, making it a multidisciplinary institution.

• The museum plays a crucial role in promoting and preserving India's cultural history and heritage.

**Q55. Answer: (c) force, magnetic field**

The correct answer is force, magnetic field.

Key Points

• In accordance to Fleming's left hand rule used to find the direction of force on a current carrying conductor placed inside a magnetic field, the centre finger and the index finger represent the directions of current and magnetic field.

• Fleming's left-hand rule can be expressed as stretching the left hand's thumb, middle finger, and forefinger until they are all perpendicular to one another and the middle finger denotes the direction of current in the conductor, while the forefinger denotes the direction of the magnetic field.

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

• The three directions represented by the thumb, index finger, and middle finger are as follows:

• Middle finger: Represents the direction of current flow (perpendicular to both the magnetic field and force).

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• Index finger: Points in the direction of the magnetic field.
• Thumb: Points in the direction of the force acting on the conductor.
• It is commonly applied in situations involving electric motors, generators, and other electromagnetic devices.

Additional Information

Right-Hand Rule:

• There is also a right-hand version of this rule, where the thumb represents the direction of the force, and the other fingers represent the magnetic field and current.
• The choice between left-hand and right-hand rules depends on the context and conventions used.
• The cross product of two vectors.
• The force on a current-carrying conductor in a magnetic field.
• Imagine your right hand:
• Extend your thumb, index finger, and middle finger perpendicular to each other.
• These three fingers represent different directions.
• The thumb points in the direction of the motion (velocity) of a conductor relative to the magnetic field.
• For example, in a generator, it indicates the direction of motion of the wire.
• Index Finger:
• The index finger points in the direction of the magnetic field.
• It represents the orientation of the magnetic lines of force.
• Middle Finger:
• The middle finger points in the direction of the induced current (or the force acting on the conductor).
• It shows how the current flows due to the interaction with the magnetic field.

**Q56. Answer: (b) Sunday**

Given: 15 March 2022 was a Tuesday.

Now,

15 March 2020 to 15 March 2022 = 2 Years (2020 will not be counted as Leap year, because February is not included here).

So, 2 Ordinary Year has 2 odd days.

then, 15 March 2020 was Tuesday - 2 = Sunday.

Hence, the correct answer is "Option 2".

**Q57. Answer: (a) S**

Given: S, T, U, V, W and X live on six different floors of the same building.

The lowermost floor in the building is numbered 1, the floor above it is numbered 2, and so on till the topmost floor is numbered 6.

1) V lives on the lowermost floor.

2) W lives on floor number 2.

| Floor | Person |
|---|---|
| 6 | |
| 5 | |
| 4 | |
| 3 | |
| 2 | W |
| 1 | V |

3) T lives exactly between U and W.

| Floor | Person |
|---|---|
| 6 | |
| 5 | |
| 4 | U |
| 3 | T |

| | |
|---|---|
| 2 | W |
| 1 | V |

4) X and U each live on an even numbered floor.

And, S will live on the remaining floor.

| Floor | Person |
|---|---|
| 6 | X |
| 5 | S |
| 4 | U |
| 3 | T |
| 2 | W |
| 1 | V |

So, 'S' lives on the floor number 5.

Hence, the correct answer is "Option 1".

**Q58. Answer: (a) AB and CD**

The correct answer is AB and CD.

Key Points

Light Path Analysis:

• Incident Ray: The ray that enters the prism at point B, travelling from A to B.

• Emergent Ray: The ray that exits the prism at point C, travelling from C to D.

• This configuration illustrates the basic principles of light refraction through a prism.

• The ray's entry and exit points define the path the light takes through the optical medium.

• Understanding these paths is crucial for applications in optics and photonics.

Thus, the incident ray is AB and the emergent ray is CD, corresponding to the paths of light as it travels through the prism.

Additional Information

Refraction and Prisms:

• Refraction is the bending of light as it passes from one medium to another of different density.

• Prisms are used to disperse light into its constituent spectral colors.

• The angle and material of the prism determine the degree and direction of light bending.

• Applications include spectroscopy, optical instruments, and educational demonstrations in physics.

**Q59. Answer: (d) 6 cm**

Shortcut Trick

Ratio-based logic: Volume of sphere prop. to radius$^3$.

Given Volume = 36π cm$^3$.

Using (4/3) × π × r$^3$ = 36π => r$^3$ = (36 × 3) / 4 = 27.

Radius (r) = $\sqrt[3]{27}$ = 3 cm.

Diameter = 2 × r = 2 × 3 = 6 cm.

Therefore The correct answer is 6 cm.

Alternate Method

Given:

Volume of the sphere = 36π cm$^3$

Formula Used:

Volume (V) = (4/3) × π × r$^3$

Diameter (d) = 2 × r

Calculations:

=> (4/3) × π × r$^3$ = 36π

=> (4/3) × r$^3$ = 36

=> r$^3$ = (36 × 3) / 4

=> $r^3 = 9 \times 3$

=> $r^3 = 27$

=> $r = \sqrt[3]{27} = 3$ cm

=> Diameter (d) = $2 \times 3 = 6$ cm

Therefore The correct answer is 6 cm.

Additional Information

Surface Area of Sphere

The total surface area of a sphere is given by the formula: $A = 4 \times \pi \times r^2$.

Hemisphere Volume and Area

Volume of hemisphere = $(2/3) \times \pi \times r^3$ and its Total Surface Area = $3 \times \pi \times r^2$.

Volume of a Cylinder

For comparison, the volume of a cylinder with radius r and height h is $V = \pi \times r^2 \times h$.

**Q60. Answer: (c) The roots are real and distinct.**

Shortcut Trick

For any quadratic equation $ax^2 + bx + c = 0$, if the product of a and c is negative (i.e., $ac < 0$), the discriminant $D = b^2 - 4ac$ will always be positive.

In the given equation $3x^2 + 6x - 5 = 0$, $a = 3$ and $c = -5$, so $ac = -15$.

Since $ac < 0$, the discriminant D must be greater than zero ($D > 0$).

When $D > 0$, the roots are always real and distinct.

Therefore The correct answer is The roots are real and distinct.

Alternate Method

Given:

Quadratic Equation: $3x^2 + 6x - 5 = 0$

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

$a = 3, b = 6, c = -5$

Formula Used:

The nature of roots is determined by the Discriminant (D):

$D = b^2 - 4ac$

Calculations:

=> $D = (6)^2 - 4 \times (3) \times (-5)$

=> $D = 36 - (-60)$

=> $D = 36 + 60$

=> $D = 96$

Since the value of D (96) is greater than 0, the roots of the equation are real and distinct (unequal).

Therefore The correct answer is The roots are real and distinct.

Additional Information

Nature of Roots Summary

1. If $D > 0$, the roots are real and distinct. 2. If $D = 0$, the roots are real and equal. 3. If $D < 0$, the roots are imaginary (no real roots).

Quadratic Formula

The roots of $ax^2 + bx + c = 0$ are given by $x = (-b \pm \sqrt{D}) \div 2a$, where $D = b^2 - 4ac$.

Perfect Square Discriminant

If a, b, and c are rational and D is a perfect square, the roots are rational and distinct. If D is not a perfect square, the roots are irrational and occur in conjugate pairs.

**Q61. Answer: (a) 33.33%**

Shortcut Trick

Interest for 3 years (5 − 2) = Rs. 2,000 − Rs. 1,250 = Rs. 750.

Interest for 1 year = Rs. 750 ÷ 3 = Rs. 250.

Principal (P) = Rs. 1,250 − (2 × Rs. 250) = Rs. 750.

Rate % = (Interest per year ÷ Principal) × 100 = (250 ÷ 750) × 100 = 33.33%.

Therefore The correct answer is 33.33%.

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Alternate Method

Given:

Amount in 2 years (A2) = Rs. 1,250

Amount in 5 years (A5) = Rs. 2,000

Formula Used:

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

Amount (A) = Principal (P) + Simple Interest (SI)

Calculations:

=> Interest for 3 years = A5 − A2

=> Interest for 3 years = Rs. 2,000 − Rs. 1,250 = Rs. 750

=> Interest for 1 year = 750 ÷ 3 = Rs. 250

=> Interest for 2 years = 2 × 250 = Rs. 500

=> Principal (P) = A2 − Interest for 2 years = 1,250 − 500 = Rs. 750

=> Rate (R) = (SI for 1 year × 100) ÷ (P × 1)

=> R = (250 × 100) ÷ (750 × 1)

=> R = 100 ÷ 3 = 33.33%

Therefore The correct answer is 33.33%.

Additional Information

Constant Interest Property

In Simple Interest, the interest earned remains the same every year because it is always calculated on the original Principal.

Simple Interest vs Compound Interest

While SI is constant, Compound Interest (CI) increases every year as interest is earned on both the principal and the accumulated interest of previous years.

Relationship between Rate and Time

For a fixed principal, the Simple Interest is directly proportional to both the Rate and the Time period (SI prop. to R × T).

**Q62. Answer: (b) 3824**

Shortcut Trick

A number divisible by 8 is always divisible by 4.

Check the last three digits for divisibility by 8.

(1) 382 ÷ 8 = 47.75 (No)

(2) 824 ÷ 8 = 103 (Yes)

Therefore The correct answer is 3824.

Alternate Method

Given: Numbers 4382, 3824, 8342, 3842.

Divisibility Rules:

A number is divisible by 4 if its last two digits are divisible by 4.

A number is divisible by 8 if its last three digits are divisible by 8.

Checking each option:

=> 4382: Last two digits 82 (82 ÷ 4 = 20.5). Not divisible by 4.

=> 3824: Last two digits 24 (24 ÷ 4 = 6). Divisible by 4.

=> 3824: Last three digits 824 (824 ÷ 8 = 103). Divisible by 8.

=> 8342: Last two digits 42 (42 ÷ 4 = 10.5). Not divisible by 4.

=> 3842: Last two digits 42 (42 ÷ 4 = 10.5). Not divisible by 4.

Therefore The correct answer is 3824.

Additional Information

Divisibility by powers of 2

For $2^n$, check if the last n digits are divisible by $2^n$. For 2 ($2^1$) check last 1 digit, for 4 ($2^2$) check last 2, for 8 ($2^3$) check last 3.

LCM Relationship

Since 8 is a multiple of 4, the LCM(4, 8) = 8. Any number divisible by 8 is automatically divisible by 4.

**Q63. Answer: (b) -6/5**

The correct answer is -6/5.

Key Points

• The formula for magnification (m) is given by m = -v/u, where v is the distance of the image from the lens, and u is the distance of the object from the lens.

• In this case, v = 30 cm (since the image is real and on the opposite side of the lens, we take it as positive) and u = -25 cm (object distance is taken as negative according to the sign convention).

• Substituting these values into the formula gives m = -30/(-25) = 6/5.

• The magnification is negative (-6/5) indicating that the image is inverted relative to the object.

• The magnitude of the magnification (6/5) indicates that the image is larger than the object.

Additional Information

• Converging lenses are lenses that converge rays of light that are traveling parallel to its principal axis. These lenses are thicker at the center than at the edges and are used to correct hyperopia (farsightedness).

• They can form both real and virtual images, depending on the position of the object relative to the lens.

• Real images are formed when light rays actually converge at a point, whereas virtual images are formed when light rays appear to diverge from a point.

• In the context of optical systems, magnification is a measure of how much larger or smaller the image is compared to the object itself.

**Q64. Answer: (b) Filtration, selective reabsorption, Elimination**

The correct answer is Filtration, selective reabsorption, Elimination.

Key Points

• Filtration: Filtration occurs in the glomerulus, where blood components (except large molecules like proteins) are filtered into the nephron to form the initial glomerular filtrate.

• Selective Reabsorption: After glomerular filtration, essential substances (such as glucose, amino acids, and ions) are selectively reabsorbed back into the bloodstream by the renal tubules..

• Elimination: After reabsorption and further modification in the nephron, the remaining waste products and excess substances form urine, which is eventually eliminated from the body through the ureters and bladder.

• Filtration: During filtration, blood enters the glomerulus, a network of intertwined capillaries within the nephrons. Here, filterable components (such as water and nitrogenous waste) move from the blood into the glomerulus, forming the glomerular filtrate.

• Secretion: Finally, secretion involves the transfer of substances (such as hydrogen ions, creatinine, drugs, and urea) from the blood into the collecting duct.

Additional Information

• Filterable components (such as water and nitrogenous waste) move from the blood into the glomerulus, forming the glomerular filtrate.

• Water, glucose, amino acids, and ions (such as sodium, potassium, and calcium) are actively or passively transported from the tubules into the peritubular capillaries.

• This initial filtrate is called the glomerular filtrate and contains water, electrolytes, glucose, amino acids, and waste products.

• Water, glucose, amino acids, and ions (such as sodium, potassium, and calcium) are actively or passively transported from the tubules into the peritubular capillaries.

• The reabsorbed and secreted substances merge in the collecting ducts.

• The final urine composition depends on the body’s needs, fluid intake, and hormonal regulation (such as antidiuretic hormone, aldosterone, and atrial natriuretic peptide).

**Q65. Answer: (d) Kerala - Kannada**

The correct answer is Kerala - Kannada.

Key Points

• Kerala's major language is Malayalam, not Kannada. Kannada is primarily spoken in the state of Karnataka.

• Andhra Pradesh correctly matches Telugu as its major language, reflecting the linguistic identity of the state.

• Manipur's major language is correctly matched with Meitei (also known as Manipuri), which is the most spoken language in the state.

• Meghalaya has several languages, with Khasi being one of the major languages spoken, correctly reflecting the state's linguistic diversity.

• The incorrect pairing of Kerala with Kannada highlights the importance of recognizing the cultural and linguistic diversity across Indian states.

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Additional Information

| Option | Details |
|---|---|
| 1) Andhra Pradesh - Telugu | Telugu is the official language of Andhra Pradesh and is widely spoken by the majority of the state's population. |
| 2) Manipur - Meitei | Meitei (Manipuri) is recognized as the official language of Manipur, playing a central role in the state's culture and society. |
| 3) Meghalaya - Khasi | Khasi is one of the major languages of Meghalaya and is part of the Austroasiatic language family, with a rich literary tradition. |

**Q66. Answer: (c) Pollination**

The Correct Answer is Grafting.

Key Points

• Grafting: Grafting is a horticultural technique where a part of one plant (the scion) is attached to another (the rootstock) to create a new plant. It involves combining different plant tissues but is not a form of reproduction.

• a horticultural technique that allows us to create new plants by combining different plant tissues.

• Grafting is a method used to join parts of two different plants so that they grow together as a single plant.

• The resulting plant inherits characteristics from both the scion and the rootstock.

• Desired Traits: Grafting allows us to propagate plants with specific traits, such as disease resistance, fruit quality, or flower color.

• Compatibility: Some plants do not grow well from seeds or cuttings, but grafting ensures compatibility.

• Rootstock Influence: The rootstock affects factors like growth rate, drought tolerance, and soil adaptation.

• Repair and Healing: Grafting can repair damaged trees or rejuvenate old ones.

Additional Information

• Steps in Grafting:

• Selecting Scion and Rootstock: Choose healthy, disease-free specimens.

• Making Cuts: Precise cuts are crucial for successful grafting.

• Joining Scion and Rootstock: Align the cambium layers (the green layer just under the bark) for optimal healing.

• Securing the Union: Use grafting tape or rubber bands to hold the scion and rootstock together.

• Healing and Growth: Over time, the graft union heals, and the scion grows.

• Applications:

• Fruit Trees: Apple, pear, peach, and citrus trees are commonly grafted.

• Ornamental Plants: Roses, camellias, and flowering shrubs.

• Vines: Grapevines and kiwi vines.

• Nut Trees: Walnut, pecan, and almond trees.

**Q67. Answer: (c) Consumer Protection Act**

The correct answer is Consumer Protection Act.

Key Points

• COPRA stands for Consumer Protection Act.

• It was enacted in 1986 in India to protect the interests of consumers.

• The act provides for the establishment of consumer councils and other authorities for the settlement of consumer disputes.

• It covers all goods and services until specified otherwise.

• The act also outlines the rights of consumers and the responsibilities of suppliers.

Additional Information

• The COPRA was amended in 2019 to address the advent of online markets.

• The 2019 amendment introduced provisions for the establishment of the Central Consumer Protection Authority (CCPA) to regulate matters related to violation of consumer rights, unfair trade practices, and misleading advertisements.

• The amendments aim to simplify the dispute resolution process, making it more accessible and efficient for consumers.

• It also introduced concepts like mediation as a dispute resolution mechanism, providing a faster resolution to consumer grievances.

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**Q68. Answer: (d) 2**

Given numbers: 5 1 2 6 3 8 6 5 3 6 5 3 2 5 6 9 5 1 7 2

Numbers which is immediately preceded by an even number and also immediately followed by an even number.

So, the pattern needed is: Even Number - Number - Even Number

Now,

So, there are '2' such numbers which is immediately preceded by an even number and also immediately followed by an even number.

Hence, the correct answer is "Option 4".

**Q69. Answer: (b) Floor 5**

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

The lowermost floor in the building is numbered 1, the floor above it is number 2, and so on till the topmost floor is numbered 7.

1) Q lives on floor number 2.

2) R lives on the topmost floor.

3) R lives on the floor immediately above U's floor.

| Floor | Person |
|---|---|
| 7 | R |
| 6 | U |
| 5 | |
| 4 | |
| 3 | |
| 2 | Q |
| 1 | |

4) Only one person lives between the floors of R and P.

5) Only three persons live between the floors of T and P.

| Floor | Person |
|---|---|
| 7 | R |
| 6 | U |
| 5 | P |
| 4 | |
| 3 | |
| 2 | Q |
| 1 | T |

6) S is on the floor immediately below V's floor.

| Floor | Person |
|---|---|
| 7 | R |
| 6 | U |
| 5 | P |
| 4 | V |
| 3 | S |
| 2 | Q |
| 1 | T |

So, P lives on the 5th floor.

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Hence, the correct answer is "Option 2".

**Q70. Answer: (d) (19, 8, 23)**

The logic followed here is:

Logic: (Difference of 1st and 3rd number) × 2 = 2nd number.

Now,

For, (35, 12, 29)

=> (35 - 29) × 2

=> 6 × 2 = 12.

For, (23, 16, 31)

=> (31 - 23) × 2

=> 8 × 2 = 16.

Similarly, for (19, 8, 23)

=> (23 - 19) × 2

=> 4 × 2 = 8.

Hence, the correct answer is "Option 4".

**Q71. Answer: (d) 2**

Shortcut Trick

For any quadratic equation ax2 + bx + c = 0, the product of the roots is given by the formula c ÷ a.

Comparing the given equation 3x2 − 13x + 6 = 0 to the standard form, we get:

a = 3 and c = 6.

Product of the roots = 6 ÷ 3 = 2.

Therefore The correct answer is 2.Alternate Method

Given:

The quadratic equation is 3x2 − 13x + 6 = 0.

Formula Used:

For a standard quadratic equation ax2 + bx + c = 0 having roots α and β:

Product of roots (α × β) = c ÷ a

Calculations:

Compare the given quadratic equation with the standard equation ax2 + bx + c = 0:

=> a = 3

=> b = −13

=> c = 6

Let the roots of the given equation be α and β.

=> Product of roots (α × β) = c ÷ a

=> Product of roots = 6 ÷ 3

=> Product of roots = 2

Therefore The correct answer is 2.Additional Information

Sum of the Roots

For a quadratic equation ax2 + bx + c = 0, the sum of the roots (α + β) is equal to −b ÷ a.

Discriminant and Nature of Roots

The discriminant (D) is given by b2 − 4ac. If D > 0, roots are real and distinct. If D = 0, roots are real and equal. If D < 0, roots are complex/imaginary.

Quadratic Formula

The roots of a quadratic equation can be calculated using the formula: x = (−b ± √(b2 − 4ac)) ÷ (2a).

**Q72. Answer: (d) Two**

The correct answer is Two.

Key Points

• The electronic configuration of carbon (C) is $1s^2\ 2s^2\ 2p^2$.

• Carbon has a total of 6 electrons.

• These electrons are distributed in two shells: the K shell and the L shell.

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• The first shell (K shell) can hold a maximum of 2 electrons, and the second shell (L shell) can hold up to 8 electrons, but in the case of carbon, it has only 4 electrons in the L shell.

• Thus, carbon utilizes two shells to accommodate its 6 electrons, which explains why the correct answer is two.

Additional Information

• Carbon is a nonmetallic chemical element in group 14 of the periodic table.

• Its atomic number is 6, and it is widely known for its versatility in forming covalent bonds with other elements.

• Carbon compounds are the basis of all known life on Earth, making carbon an essential element in biology and organic chemistry.

• It exists in various allotropes, including graphite, diamond, and amorphous carbon.

• Carbon's ability to form polymers at the molecular level is the foundation of the vast field of plastics.

**Q73. Answer: (a) 11 5/11 days**

Shortcut Trick

Total work equating: (5m + 6w) × 6 = (3m + 5w) × 9

=> 30m + 36w = 27m + 45w => 3m = 9w => 1m = 3w

Total Work in terms of women = (5 × 3 + 6) × 6 = 21 × 6 = 126 units

Required Efficiency (3m + 2w) = (3 × 3 + 2) = 11 units

Days = 126 ÷ 11 = 11 5/11 days

Therefore The correct answer is 11 5/11 days.

Alternate Method

Given: 5 men (M) and 6 women (W) finish in 6 days; 3 M and 5 W finish in 9 days.

Formula Used: Total Work = Efficiency × Time

| Group | Days | Total Work | Efficiency |
|---|---|---|---|
| 5M + 6W | 6 | 18 (Ratio) | 3 |
| 3M + 5W | 9 | 2 | |

=> 5M + 6W = 3 --- (i)

=> 3M + 5W = 2 --- (ii)

=> Multiplying (i) by 3 and (ii) by 5:

=> 15M + 18W = 9

=> 15M + 25W = 10

=> Subtracting: 7W = 1 => W = 1/7

=> 3M + 5(1/7) = 2 => 3M = 2 − 5/7 => 3M = 9/7 => M = 3/7

=> Total Work = (5 × 3/7 + 6 × 1/7) × 6 = (21/7) × 6 = 3 × 6 = 18 units

=> Efficiency of (3M + 2W) = 3(3/7) + 2(1/7) = 11/7

=> Required Days = 18 ÷ (11/7) = 126/11 = 11 5/11 days

Therefore The correct answer is 11 5/11 days.

Additional Information

Work Equating Principle

M1D1H1/W1 = M2D2H2/W2. This rule is used to compare the work done by different groups of people.

Efficiency Ratio

Efficiency is inversely proportional to time taken. If the ratio of time is a:b, the ratio of efficiency is b:a.

Combined Work

When multiple types of workers (men, women, children) work together, their individual efficiencies are added to calculate the total group efficiency.

**Q74. Answer: (a) Dadabhai Naoroji**

The correct answer is Dadabhai Naoroji.

Key Points

• Dadabhai Naoroji, also known as the "Grand Old Man of India," was a key figure in the Indian independence movement and a founding member of the Indian National Congress.

• He is credited with calculating the first estimates of India's national income in 1876, highlighting the economic impact of British rule in India.

• Naoroji's work laid the foundation for future economic research in India and was instrumental in raising awareness about the economic exploitation of India under British rule.

• His methodology and estimates were pioneering efforts at a time when systematic economic data collection was not in practice in India.

| Option | Details |
|---|---|
| PC Mahalanobis | Known for his contributions to statistics; founder of the Indian Statistical Institute. |
| VKRV Rao | An economist who made significant contributions to economic planning and policy in India. |
| William Dagboi | This option appears to be a fictional or incorrect name not related to the context of Indian economic history. |

**Q75. Answer: (d) 3080 m³**

Shortcut Trick

Volume of cylindrical tank = $\pi r^2 h$

Volume = (22/7) × 7 × 7 × 20

Volume = 22 × 7 × 20 = 154 × 20 = 3080 m³

Therefore The correct answer is 3080 m³.

Alternate Method

Given:

Radius (r) = 7 m

Height (h) = 20 m

Formula Used:

Volume of Cylinder = $\pi r^2 h$

Calculations:

=> Volume = (22/7) × $(7)^2$ × 20

=> Volume = (22/7) × 49 × 20

=> Volume = 22 × 7 × 20

=> Volume = 3080 m³

Therefore The correct answer is 3080 m³.

Additional Information

Surface Area of Cylinder

Curved Surface Area (CSA) = $2\pi rh$ and Total Surface Area (TSA) = $2\pi r(h + r)$.

Volume Conversion

To convert cubic meters to liters, multiply by 1000 since 1 m³ = 1000 liters.

Properties of a Cylinder

A right circular cylinder has two parallel circular bases and a curved surface perpendicular to the bases.

**Q76. Answer: (a) Haryana**

The correct answer is Haryana.

Key Points

• Haryana had the highest unemployment rate in India in January 2022 according to the Centre for Monitoring the Indian Economy (CMIE).

• The unemployment rate is a significant economic indicator, reflecting the percentage of the labor force that is jobless and seeking employment.

• CMIE is a leading independent think-tank focused on generating and analyzing data related to the Indian economy, including employment trends.

• High unemployment rates can lead to economic and social challenges, including reduced consumer spending and increased poverty.

• Addressing unemployment requires multifaceted approaches, including policy reforms, education and skill development, and investment in sectors generating employment.

Additional Information

The Centre for Monitoring the Indian Economy (CMIE) plays a critical role in providing data and analysis on various aspects of the

Indian economy. Key points about CMIE include:

• Established in 1976, CMIE has been at the forefront of offering comprehensive and accurate data about the Indian economy.

• It provides data on the economy, industries, and the corporate sector, helping in policy formulation, academic research, and business decision-making.

• CMIE conducts large-scale surveys to collect data on employment, consumer sentiments, and household incomes, among other parameters.

• Its unemployment data is widely regarded as a reliable indicator of the job market and labor force dynamics in India.

• Through its analyses, CMIE contributes to understanding economic trends, challenges, and opportunities in India.

**Q77. Answer: (c) precipitation reaction**

The correct answer is precipitation reaction.

Key Points

• Precipitation reactions occur when two solutions combine to form an insoluble solid called a precipitate.

• These reactions are a subset of double displacement reactions where ions switch places, resulting in the formation of at least one insoluble product.

• The solubility rules help predict whether a precipitate will form in a reaction.

• Commonly used in analytical chemistry to isolate or identify ions in a solution.

Additional Information

| Option | Details |
|---|---|
| 1) Redox reaction | Involves the transfer of electrons between two species. It's a combination of reduction and oxidation reactions. |
| 2) Displacement reaction | A type of redox reaction where an element reacts with a compound and takes the place of another element in that compound. |
| 4) Decomposition reaction | A reaction in which a single compound breaks down into two or more elements or new compounds. |

**Q78. Answer: (d) R/2**

The correct answer is R/2.

Key Points

• Resistance (R) of a conductor determines how much it opposes the flow of electric current through it.

• When a given resistance R is cut into 2 equal parts, each part has a length that is half of the original.

• The resistance of a conductor is directly proportional to its length. Thus, halving the length of the conductor halves its resistance.

• Therefore, the resistance of each part after cutting is R/2.

Additional Information

• Ohm's Law states that the current through a conductor between two points is directly proportional to the voltage across the two points, introducing the concept of resistance.

• Resistance is measured in units of ohms (Ω), where 1 ohm (Ω) equals 1 volt per ampere.

• The formula to calculate resistance is R = ρ(L/A), where ρ is the resistivity of the material, L is the length, and A is the cross-sectional area.

• Factors affecting resistance include the material of the conductor, its length, cross-sectional area, and temperature.

**Q79. Answer: (a) 84 years**

Shortcut Trick

Ratio 14 years ago (Father : Son) = 3 : 1 (Difference = 2 units)

Ratio Now (Father : Son) = 2 : 1 → Multiply by 2 to equate difference → 4 : 2 (Difference = 2 units)

Change in units for Father (4 − 3) or Son (2 − 1) = 1 unit → 14 years

Sum of present units = 4 + 2 = 6 units

Sum of present ages = 6 × 14 = 84 years

Therefore The correct answer is 84 years.

Alternate Method

Given: Present ratio F = 2S. 14 years ago, (F − 14) = 3(S − 14).

=> Substitute F = 2S in the second equation:

=> 2S − 14 = 3S − 42

=> 3S − 2S = 42 − 14

=> Son's present age (S) = 28 years

=> Father's present age (F) = 2 × 28 = 56 years

=> Sum of ages = 56 + 28 = 84 years

Therefore The correct answer is 84 years.

Additional Information

Age Ratio Difference Rule

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

Sum of Ages in 'n' Years

If the current sum of ages of two people is S, then after 'n' years, the sum will be S + 2n.

**Q80. Answer: (d) Only conclusion II is true**

Given Statement: H > Y ≥ S = X = A > W

Now,

Conclusions:

(i) H < S → False (H > Y ≥ S It gives H > S)

(ii) A ≤ Y → True (Y ≥ S = X = A It gives Y ≥ A)

Here, Only conclusion II is true.

Hence, the correct answer is "Option 4".

**Q81. Answer: (a) Both arguments I and II strengthen the statement**

Given:

Statement :

Apartment complexes have decided to charge a heavy penalty on residents who do not segregate their dry waste and wet waste.

Now,

Arguments :

I. The government has mandated segregation of wet waste and dry waste by all homeowners - True (As the statement says the government has mandated waste segregation, apartment complexes are legally obligated to enforce it within their premises. This is strong argument).

II. All apartments have been provided with separate bins for dry waste and wet waste to facilitate garbage segregation - True (As the statement clearly mentioned that Apartment complexes have decided to charge because they provided the bins for dry waste and wet waste to facilitate garbage segregation).

So, Both arguments I and II strengthen the statement.

Hence, the correct answer is "Option 1".

**Q82. Answer: (d) Rs. 1,881**

Shortcut Trick

When Percentage Profit at SP1 equals Percentage Loss at SP2, the Cost Price (CP) is the Average of the two Selling Prices.

CP = (1,920 + 1,500) ÷ 2 = 3,420 ÷ 2 = Rs. 1,710.

To earn 10% profit, multiplier SP = CP × (100 + P%) ÷ 100.

New SP = 1,710 × 1.1 = Rs. 1,881.

Therefore The correct answer is Rs. 1,881.

Alternate Method

Given → SP1 = Rs. 1,920, SP2 = Rs. 1,500, Profit% = Loss%, Target Profit = 10%.

Formulas: Profit = SP − CP | Loss = CP − SP | Profit% = (Profit ÷ CP) × 100 | SP = CP × (110 ÷ 100).

=> Let CP be x. According to the question: (1,920 − x) ÷ x × 100 = (x − 1,500) ÷ x × 100.

=> 1,920 − x = x − 1,500.

=> 2x = 3,420 => x = 1,710.

=> For 10% Profit, New SP = 1,710 + (10% of 1,710).

=> New SP = 1,710 + 171 = Rs. 1,881.

Therefore The correct answer is Rs. 1,881.

Additional Information

Cost Price when Profit = Loss

If the numerical value of profit earned at one price is equal to the loss incurred at another price, the Cost Price is exactly the midpoint of the two selling prices.

Selling Price Calculation

To find the final selling price for a desired profit percentage (k%), use the formula: SP = CP × (100 + k) ÷ 100.

**Q83. Answer: (a) Goods and Service Tax Council**

Key Points

• Article 279A of the Indian Constitution deals with the formation of the Goods and Service Tax Council.

• This council is tasked with making recommendations to the Union and State Governments on issues related to goods and service tax.

• The GST Council is chaired by the Union Finance Minister and includes the Minister of State in charge of Revenue or Finance and Ministers in charge of Finance or Taxation from all states.

• It aims to develop a harmonized national market of goods and services and to implement a tax that is common across all states in India, thereby improving the overall economic efficiency.

Additional Information

| Option | Details |
|---|---|
| 2) Election Commission of India | Responsible for administering election processes in India. Ensures free and fair elections in the country. |
| 3) Finance Commission | Constituted by the President of India every five years to define financial relations between the central government and the states. |
| 4) UPSC | The Union Public Service Commission conducts examinations for recruitment to various services of the Government of India. |

**Q84. Answer: (c) Karnataka**

The correct answer is Karnataka.

Key Points

• Basavaraj Bommai is the Chief Minister of Karnataka who launched the AAYU app.

• The AAYU app was launched in May 2022 to enhance health and wellness services in the state.

• This app aims to provide easy access to healthcare services for the people of Karnataka.

• It is part of the state's initiative to digitize healthcare and make health services more accessible to its citizens.

Additional Information

• The app AAYU is designed to offer a comprehensive healthcare platform that includes teleconsultation, health tips, and emergency services.

• It supports the government's vision to improve public health infrastructure and outcomes through digital solutions.

• By promoting preventive care and timely medical intervention, AAYU aims to reduce the burden on traditional healthcare facilities.

• The initiative reflects Karnataka's commitment to leveraging technology for public welfare and setting a precedent for digital health initiatives in India.

**Q85. Answer: (b) Athletics**

The correct answer is Athletics.

Key Points

• TP Ouseph was honoured with the Dronacharya Award in 2021 for his outstanding contribution to the sport of athletics.

• The Dronacharya Award is a prestigious recognition presented by the Ministry of Youth Affairs and Sports, government of India, to celebrate the excellence of coaches in sports and games.

• It is named after Dronacharya, the legendary mentor of archery and martial arts in the epic Mahabharata, symbolizing the pinnacle of respect for coaches in India.

• The award highlights the hard work and dedication of coaches who have trained athletes to achieve national and international success, thereby elevating the standard of sports in India.

• Recipients of the Dronacharya Award are given a bronze statuette of Dronacharya, a certificate, ceremonial dress, and a cash prize to acknowledge their contributions.

Additional Information

• The Dronacharya Award was instituted in 1985 to honor coaching excellence in India.

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• It recognizes the efforts of coaches across all sports disciplines where Indians compete at the international level, including athletics, cricket, hockey, and more.

• The selection process for the award is highly competitive, with nominations scrutinized by a panel of experts and former athletes to ensure the recipients have made significant contributions to their sports.

• Over the years, the Dronacharya Award has helped elevate the status of sports coaching in India, encouraging more professionals to take up coaching as a serious career option.

• The award has also played a crucial role in highlighting the importance of coaches in developing sports talent in the country, leading to better infrastructure and support for coaches.

**Q86. Answer: (c) 2 V**

The correct answer is 2 V.

Key Points

Given:

A 5V battery is connected in series with a 4 ohm and a 6 ohm resistor.

R_(total) = R1 + R2 = 4 + 6 = 10 Ω

I = V / R_(total) = 5/10 = 0.5 A

So, V_(4Ω) = I × R1 = 0.5 × 4 = 2 V

Additional Information

Applications of Ohm's Law:

• Ohm's Law is fundamental for the analysis and design of electrical circuits, used widely to calculate voltages, currents, or resistances.

• It helps in understanding the behavior of circuits under different electrical loads and conditions.

**Q87. Answer: (c) $9a^2 + 16b^2 + 4c^2 - 24ab + 16bc - 12ac$**

Shortcut Trick

Apply the Identity $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$ directly.

Substitute x = 3a, y = −4b, and z = −2c into the formula.

Square terms: $(3a)^2 = 9a^2$, $(-4b)^2 = 16b^2$, $(-2c)^2 = 4c^2$.

Product terms: $2(3a)(-4b) = -24ab$, $2(-4b)(-2c) = +16bc$, $2(-2c)(3a) = -12ac$.

Combine all parts to get the final Algebraic Expansion.

Therefore The correct answer is $9a^2 + 16b^2 + 4c^2 - 24ab + 16bc - 12ac$.

Alternate Method

Given: The expression to expand is $(3a - 4b - 2c)^2$.

Formula Used: $(x + y + z)^2 = x^2 + y^2 + z^2 + 2xy + 2yz + 2zx$

=> Let x = 3a, y = −4b, and z = −2c.

=> $(3a - 4b - 2c)^2 = (3a)^2 + (-4b)^2 + (-2c)^2 + 2(3a)(-4b) + 2(-4b)(-2c) + 2(-2c)(3a)$

=> $(3a - 4b - 2c)^2 = 9a^2 + 16b^2 + 4c^2 + (-24ab) + (16bc) + (-12ac)$

=> $(3a - 4b - 2c)^2 = 9a^2 + 16b^2 + 4c^2 - 24ab + 16bc - 12ac$

Therefore The correct answer is $9a^2 + 16b^2 + 4c^2 - 24ab + 16bc - 12ac$.

Additional Information

Trinomial Square Identity

The general expansion is $(a + b + c)^2 = a^2 + b^2 + c^2 + 2ab + 2bc + 2ca$. The signs of the cross-products change according to the signs of the individual terms.

Binomial Square Identities

Related foundational identities include $(a + b)^2 = a^2 + 2ab + b^2$ and $(a - b)^2 = a^2 - 2ab + b^2$.

Sign Convention Rule

When squaring any real number (positive or negative), the result is always non-negative. For product terms: (+)×(−) = (−) and (−)×(−) = (+).

**Q88. Answer: (d) Contour ploughing**

The correct answer is Contour ploughing.

Key Points

• Contour ploughing is a farming practice that involves ploughing and planting across a slope following its elevation contour lines.

• These contour lines create a water break, which significantly reduces the formation of rills and gullies during rainstorms, thus

preventing soil erosion.

• Contour ploughing helps to conserve rainwater by allowing it to soak into the soil, thus increasing soil moisture and reducing soil erosion.

• It is considered a cost-effective and simple method of soil conservation, suitable for various landscapes and farming systems.

Additional Information

Soil erosion is the displacement of the upper layer of soil, one form of soil degradation. This natural process is caused by the dynamic activity of erosive agents, that is, water, ice, snow, air, plants, animals, and humans. In agriculture, soil erosion refers to the wearing away of a field's topsoil by the natural physical forces of water and wind or through forces associated with farming activities such as tillage. Erosion, if left unchecked, can lead to decreased agricultural productivity due to loss of nutrient-rich upper soil layers. Other impacts of erosion include reduced water quality, sedimentation in waterways, and decreased soil depth.

**Q89. Answer: (c) Boxing**

The correct answer is Boxing.

Key Points

• Sandhya Gurung was honored with the Dronacharya Award in 2021 for her exceptional contribution to the field of boxing as a coach.

• This prestigious award is given by the Government of India to recognize outstanding coaches in sports and games.

• The award showcases the importance of coaches in nurturing talent and contributing to the sports ecosystem in India.

• Gurung's coaching has been instrumental in producing top-notch boxers who have represented India at various international competitions.

• Her dedication and efforts have significantly contributed to the development and success of Indian boxing.

Additional Information

• The Dronacharya Award is named after the legendary archery coach, Dronacharya, a figure from the Indian epic Mahabharata.

• It was introduced in 1985 to honor coaching excellence in India.

• The award includes a bronze statuette of Dronacharya, a certificate, ceremonial dress, and a cash prize.

• It highlights the government's recognition of the hard work and dedication of sports coaches towards developing athletes and sports in the country.

• The award emphasizes the value of mentorship in sports and the crucial role coaches play in achieving sporting excellence.

**Q90. Answer: (d) 6**

The correct answer is 6.

Key Points

• With four points on a plane where no three points are collinear, we can form straight lines by joining every pair of points.

• Since there are four points, the number of ways to select two points to form a line is given by the combination formula C(n, r) = n! / [r!(n-r)!], where n is the total number of points and r is the number of points to select.

• Substituting n = 4 and r = 2, we get C(4, 2) = 4! / [2!(4-2)!] = 6.

• Therefore, six distinct straight lines can be drawn through the four points.

Additional Information

In mathematics and geometry, the concept of collinearity is a fundamental property used to describe a straight line that passes through at least two points. Here are some additional points:

• Collinear points are points that lie on the same straight line.

• If no three points are collinear, it means that no single straight line can pass through all three points at once.

• This property is crucial in problems involving geometrical configurations, polygon formation, and network connections.

• The concept of collinearity extends to various geometric constructions, including triangles, where the non-collinearity of vertices ensures the formation of a valid polygon.

**Q91. Answer: (b) 2f**

The correct answer is 2f.

Key Points

• The distance between the pole (P) and the centre of curvature (C) of a spherical mirror is known as the radius of curvature (R).

• For any spherical mirror, the relationship between the focal length (f) and the radius of curvature (R) is given by R = 2f.

• This means that the focal length is half the radius of curvature.

• Conversely, the distance between the pole and the centre of curvature is equal to twice the focal length of the mirror.

Additional Information

• Spherical mirrors are of two types: concave and convex. A concave mirror converges light to a focal point, whereas a convex

mirror diverges light.

• The principle axis is an imaginary line that passes through the pole and the centre of curvature of a spherical mirror.

• The focal point (F) of a spherical mirror is the point on the principle axis where light rays parallel to the principle axis converge (concave) or appear to diverge from (convex) after reflection.

• The properties and uses of spherical mirrors are based on the laws of reflection, which state that the angle of incidence is equal to the angle of reflection, and both the incident ray, reflected ray, and the normal to the surface at the point of incidence lie in the same plane.

• Spherical mirrors are widely used in devices like telescopes, vehicle rearview mirrors, flashlights, and optical instruments to control and manipulate light.

**Q92. Answer: (b) Divij**

Given: Divij, Palak, Ravneet, Sejal and Tapan are sitting around a circular table facing the centre of the table.

1) Tapan is second to the right of Sejal.

2) Only Palak is sitting between Ravneet and Tapan.

3) Only Sejal is between Ravneet and Divij.

So, 'Divij' is sitting to the immediate left of Tapan.

Hence, the correct answer is "Option 2".

**Q93. Answer: (c) 24**

According to the given Venn diagram:

The shaded area shows the "total number of accountants who are also bilinguals".

So, the total number of 'total number of accountants who are also bilinguals' = 15 + 9 = 24.

Hence, the correct answer is "Option 3".

**Q94. Answer: (d) Growth of mammary glands**

The correct answer is Growth of mammary glands.

Key Points

• Adolescence is a transitional stage of physical and psychological development that generally occurs during the period from puberty to legal adulthood.

• The growth of mammary glands is a primary sexual characteristic that only occurs in girls as part of their sexual maturation during adolescence.

• Other changes such as oily skin with pimples and growth of hair on different parts of the body are common in both girls and boys.

• Being conscious of their looks is a psychological change that can occur in both genders but is not directly related to sexual maturation.

Additional Information

• Mammary glands are specialized organs in mammals that produce milk to feed young offspring.

• In humans, these glands are more prominent in females and undergo significant changes during puberty, pregnancy, and lactation.

• The development of mammary glands starts during puberty under the influence of hormones such as estrogen and progesterone.

• Besides their role in lactation, the growth and appearance of mammary glands also contribute to the secondary sexual characteristics distinguishing adult females from males.

**Q95. Answer: (a) 5 : 2 : 3**

Shortcut Trick

We know that in a partnership, Investment Ratio = Profit Ratio ÷ Time Ratio.

Investment Ratio = (5 ÷ 6) : (4 ÷ 12) : (7 ÷ 14)

=> 5/6 : 1/3 : 1/2

Multiply all parts by the LCM of denominators (6):

=> (5/6 × 6) : (1/3 × 6) : (1/2 × 6) = 5 : 2 : 3

Therefore The correct answer is 5 : 2 : 3.

Alternate Method

Given:

Time period of A (T_A) = 6 months

Time period of B (T_B) = 12 months

Time period of C (T_C) = 14 months

Profit ratio of A, B and C (P_A : P_B : P_C) = 5 : 4 : 7

Formula Used:

Profit = Investment × Time

Investment = Profit ÷ Time

Calculations:

=> Investment of A = P_A / T_A = 5 / 6

=> Investment of B = P_B / T_B = 4 / 12 = 1 / 3

=> Investment of C = P_C / T_C = 7 / 14 = 1 / 2

=> Ratio of investments (A : B : C) = 5/6 : 1/3 : 1/2

=> Multiply each term by the LCM of the denominators (6, 3, 2) which is 6.

=> A : B : C = (5/6 × 6) : (1/3 × 6) : (1/2 × 6)

=> A : B : C = 5 : 2 : 3

Therefore The correct answer is 5 : 2 : 3.

Additional Information

Compound Partnership

When capitals are invested for different time periods, the profit is shared in the ratio of the products of capital and time for each partner: P1 : P2 = (C1 × T1) : (C2 × T2).

Working and Sleeping Partners

A partner who manages the business is called a working partner, often receiving a salary or fixed percentage of profit before division. A sleeping partner only invests capital.

Investment Ratio Rule

If profit ratio and time periods are given, Investment Ratio = P1/T1 : P2/T2 : P3/T3.

**Q96. Answer: (b) ÷, ×, +, =, +**

Given equation: 20 * 4 * 6 * 2 * 14 * 18

BODMAS Table:

Let's check each option one by one.

Option 1) +, =, ÷, ×, +

Given: 20 * 4 * 6 * 2 * 14 * 18

After replacing the * signs we get;

=> 20 + 4 = 6 ÷ 2 × 14 + 18

=> 24 = 3 × 14 + 18

=> 24 = 42 + 18

=> 24 ≠ 60

=> LHS ≠ RHS

Option 2) ÷, ×, +, =, +

Given: 20 * 4 * 6 * 2 * 14 * 18

After replacing the * signs we get;

=> 20 ÷ 4 × 6 + 2 = 14 + 18

=> 5 × 6 + 2 = 32

=> 30 + 2 = 32

=> 32 = 32

=> LHS = RHS

Option 3) ÷, ×, =, +, +

Given: 20 * 4 * 6 * 2 * 14 * 18

After replacing the * signs we get;

=> 20 ÷ 4 × 6 = 2 + 14 + 18

=> 5 × 6 = 34

=> 30 ≠ 34

=> LHS ≠ RHS

Option 4) ÷, ×, -, =, ×

Given: 20 * 4 * 6 * 2 * 14 * 18

After replacing the * signs we get;

=> 20 ÷ 4 × 6 - 2 = 14 × 18

=> 5 × 6 - 2 = 252

=> 30 - 2 = 252

=> 28 ≠ 252

=> LHS ≠ RHS

Hence, the correct answer is "Option 2".

**Q97. Answer: (d) 10 km**

Shortcut Trick

Distance = [Product of Speeds ÷ Difference of Speeds] × Total Time Difference

Product of speeds = 3 × 4 = 12; Difference of speeds = 4 − 3 = 1

Total time difference = 20 min late + 30 min early = 50 min = 50/60 hours

Distance = (12 ÷ 1) × (50 ÷ 60) = 12 × 5/6 = 10 km

Therefore The correct answer is 10 km.

Alternate Method

Given: Speed1 (S1) = 3 km/h, Speed2 (S2) = 4 km/h

Time Difference (ΔT) = 20 − (−30) = 50 min = 50/60 hours

Formula Used: Time = Distance ÷ Speed

=> (D ÷ 3) − (D ÷ 4) = 50/60

=> (4D − 3D) ÷ 12 = 5/6

=> D ÷ 12 = 5/6

=> D = (5 × 12) ÷ 6

=> D = 10 km

Therefore The correct answer is 10 km.

Additional Information

Time Difference Rule

When comparing Late-Early: Add the times. When comparing Late-Late or Early-Early: Subtract the times.

Speed-Time Inversity

For a constant distance, Speed is inversely proportional to Time (S1/S2 = T2/T1).

Average Speed Formula

For the same distance covered at two different speeds x and y, Average Speed = 2xy/(x+y).

**Q98. Answer: (c) Goa**

The correct answer is Goa.

Key Points

• The 'Pink Force' initiative was launched by the Goa state government.

• This special police force is dedicated to enhancing the safety and security of women and children.

• The force operates with the aim to provide a safe environment for women and children in public places.

• Members of the 'Pink Force' are specially trained to deal with issues related to women and children.

• The initiative reflects the government's commitment to gender-sensitive policing.

Additional Information

• The concept of a 'Pink Force' or similar women-specific security wings is becoming increasingly popular in India to address and reduce crimes against women.

• Such forces are often seen patrolling public places, educational institutions, and areas where women frequently travel, to ensure their safety.

• The establishment of the 'Pink Force' also aims to encourage women to come forward and report crimes without fear, thus strengthening the justice delivery system for women and children.

• This initiative is part of a broader movement towards inclusive policing, where the needs of all sections of the society, especially the vulnerable, are addressed effectively.

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**Q99. Answer: (b) 61.248 × 6255 × 0.043**

Calculation:

6124.8 × 625.5 × 0.0043

=> 61248 × 6255 × 43 × 10^(-6)

In option 2, 61.248 × 6255 × 0.043 = 61248 × 6255 × 43 × 10^(-6) is same.

Therefore Option 2 is the correct answer.

**Q100. Answer: (c) Two**

Given: O, P, Q, R, S, T and U are seven boxes that are kept one over the other but not necessarily in the same order.

1) Q is kept at the lowermost position.

2) T is kept immediately above Q.

| |
|---|
| |
| |
| |
| |
| |
| T |
| Q |

3) Only one box is kept between S and T.

4) Only one box is kept between P and Q.

| |
|---|
| |
| |
| S |
| P |
| T |
| Q |

5) Only one box is kept between R and P.

| **O/U** |
|---|
| U/O |
| R |
| S |
| P |
| T |
| Q |

So, there are 'Two' boxes are kept between S and Q.

Hence, the correct answer is "Option 3".

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