RRB Group D Previous Year Paper (Held on: 17 Aug 2022 Shift 1)

1. Deomali Peak is in which of the following states of India?

A Karnataka

B Andhra Pradesh

C Chattisgarh

D Odisha

Solution

- The Deomali (1672m) mountain peak is situated on the Eastern Ghat in Odisha.
- It is the highest peak of Odisha.
- Deomali is a mountain peak in the Chandragiri-Pottangi subrange of the Eastern Ghats.
- It is located near Koraput town in the Koraput district of southern Odisha, India.

Highest Peak	Height(m)	State
Mount k2	8611	POK (India)
Kanchenjunga	8586	Sikkim
Nanda Devi	7817	Uttarakhand
Saltoro	7742	Jammu and Kashmir
Kangto	7090	Arunachal Pradesh
Reo Purgil	6816	Himachal Pradesh
Saramati	3841	Nagaland
Sandakphu	3636	West Bengal
Khayang	3114	Manipur
Anaimudi	2695	Kerala
Doda Beta	2636	Tamil Nadu

2. Which of the following Articles of the Indian Constitution deals with the separation of judiciary from the executive?

A Article 51

B Article 50

C Article 52

D Article 53

Solution

- Article 50 of the Indian Constitution is part of the Directive Principles of State Policy.
- It aims to separate the judiciary from the executive in the public services of the State to ensure independence.
- This separation is crucial for upholding the integrity of the judiciary and avoiding any influence or bias from the executive branch of the government.
- The objective is to maintain the rule of law and ensure a fair and impartial judicial process for all citizens.

- Article 50 is not enforceable by courts, as it is a directive principle, but it guides the governance of the country to establish a system where the judiciary operates independently of the executive branch.

Option	Details
Article 53	Specifies the executive power of the Union vested in the President and exercised directly or through officers subordinate to him.
Article 52	Establishes the office of the President of India as the head of the Executive of the Union.
Article 51	Deals with the promotion of international peace and security, encouraging respect for international law, and treaty obligations.

3. Which of the following reactions is NOT an example of neutralisation reaction?

A $H_3PO_4 + 3KOH \rightarrow K_3PO_4 + 3H_2O$

B $CaO + H_2O \rightarrow Ca(OH)_2$

C $HNO_3 + KOH \rightarrow KNO_3 + H_2O$

D $Ca(OH)_2 + H_2CO_3 \rightarrow CaCO_3 + 2H_2O$

Solution

Neutralization Reaction:

- It is a chemical reaction in which an acid and base react together to form salt and water as products.
- Example of the neutralization reaction:

  $Ca(OH)_2 + H_2CO_3 \rightarrow CaCO_3 + 2H_2O$

  $H_3PO_4 + 3KOH \rightarrow K_3PO_4 + 3H_2O$

  $HNO_3 + KOH \rightarrow KNO_3 + H_2O$

- The reaction between calcium oxide (CaO) and water (H_2O) to form calcium hydroxide $(Ca(OH)_2)$ is an example of a combination reaction and not a neutralisation reaction.

4. An amount of ₹ 1,344 is divided among three persons in the ratio of 3 : 4 : 5. The difference between the largest and the smallest shares in the distribution is:

A ₹260

B ₹224

C ₹248

D ₹236

Solution

Formula Used:

- Share = $\frac{\text{Individual's ratio}}{\text{Sum of ratios}} \times \text{Total Amount}$

Calculation:

- The ratio of their shares is 3:4:5.

  ⇒ Sum of ratios = 3 + 4 + 5 = 12

- Share of the first person = $\frac{3}{12} \times 1344$

  ⇒ Share of the first person = 336

- Share of the second person = $\frac{4}{12} \times 1344$

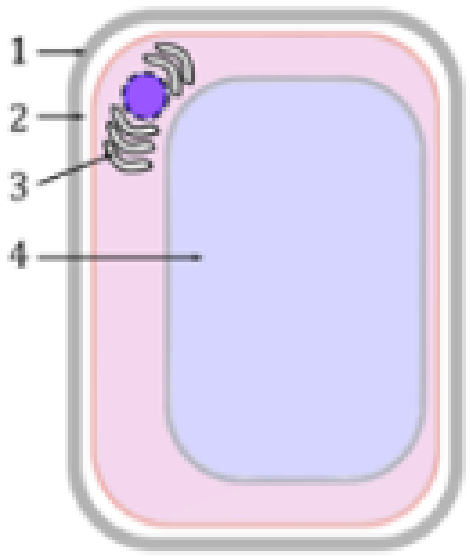
⇒ Share of the second person = 448

- Share of the third person = $\frac{5}{12} \times 1344$

  ⇒ Share of the third person = 560

- Difference between the largest and the smallest shares = 560 - 336 = ₹224

5. Where can we find waste products in a plant cell shown in the following figure?



A Region shown by arrow 1

B **Region shown by arrow 4**

C Region shown by arrow 3

D Region shown by arrow 2

Solution

- The vacuole, indicated by arrow 4, is the largest organelle in most plant cells.
- It is responsible for the storage of water and a variety of chemicals including nutrients, proteins, and waste products.
- The vacuole also maintains osmotic balance, provides structural support, and is involved in the degradation of waste materials.

- Chloroplasts: Chloroplasts are specialized organelles within plant cells that conduct photosynthesis.
- Cell Wall: The cell wall provides mechanical strength, structural support, and protection against mechanical stress and infection.
- Plasma Membrane: Typically beneath the cell wall, the plasma membrane controls the movement of substances into and out of the cell.

6. **Avina has tuitions for six subjects - Maths, English, Computer Science, Physics, Biology and Chemistry, each on a different day of a week from Monday and ending on Saturday of the same week, but not necessarily in this order. Only three subject tuitions are scheduled between Computer Science and Physics tuitions. Only Chemistry tuition is scheduled between Maths and English tuitions. Biology tuition is on Monday. Physics tuition is on the day immediately after the Maths tuition which is on Friday. Which subject's tuition is scheduled on Wednesday?**

A Physics

B **English**

C Chemistry

D Biology

Solution

- Biology tuition is on Monday.
- Only three subject tuitions are scheduled between Computer Science and Physics tuitions.

Day	Subjects
Monday	Biology
Tuesday	Computer Science
Wednesday	
Thursday	
Friday	
Saturday	Physics

- Physics tuition is on the day immediately after the Maths tuition which is on Friday.

Day	Subjects
Monday	Biology
Tuesday	Computer Science
Wednesday	
Thursday	
Friday	Maths
Saturday	Physics

- Only Chemistry tuition is scheduled between Maths and English tuitions.

Day	Subjects
Monday	Biology
Tuesday	Computer Science
Wednesday	**English**
Thursday	Chemistry
Friday	Maths
Saturday	Physics

- So, 'English' subject's tuition is scheduled on Wednesday.

7. **From the numbers 367, 489, 514, 632 and 728, if 2 is added to the first digit of each of the numbers, how many new numbers will be thus formed whose sum of all digits will be divisible by three?**

(Example- 697- First digit = 6, Second digit = 9 and Third digit = 7)

A **Two**

B Three

C One

D Four

Solution

Formula Used:

- Sum of digits divisible by 3.

Calculation:

- Adding 2 to the first digit of each number:

For 367 ⇒ 567 ⇒ 5 + 6 + 7 = 18

For 489 ⇒ 689 ⇒ 6 + 8 + 9 = 23

For 514 ⇒ 714 ⇒ 7 + 1 + 4 = 12

For 632 ⇒ 832 ⇒ 8 + 3 + 2 = 13

For 728 ⇒ 928 ⇒ 9 + 2 + 8 = 19

- Numbers whose sum of digits is divisible by 3 are 567 and 714.

8. In a triad the middle element has:

A atomic mass equal to the of sum of the first and third elements

B double the atomic mass of the first element

C double the atomic mass of the third element

D average atomic mass of the first and third elements

Solution

Dobereiner's law of triads:

- Dobereiner's law of triads states that when elements are arranged in the order of increasing atomic masses, the atomic mass of the middle element of the triad is approximately the average of the atomic masses of the other two elements.

Example:

- In the triad of Lithium, Sodium, and Potassium, the atomic mass of Lithium is 7 and the atomic mass of Potassium is 39.
- The average of masses of Lithium and Potassium gives the atomic mass of Sodium 23.

- Newland’s law of octaves: It states that when elements are arranged in order to increase atomic masses, every eighth element has properties similar to the first.
- Mendeleev’s law: The law states that the physical and chemical properties of the elements are the periodic function of their atomic masses.

9. In which of the following infections does the virus go to the immune system and damages its function?

A Cancer

B Malaria

C **HIV-AIDS**

D Typhoid

Solution

- Human immunodeficiency virus (HIV) is a virus that attacks a part of the immune system and damages its function.
- AIDS is a late stage of HIV infection.
- This virus targets white blood cells called CD4 (T cells).
- They are needed to fight off infections and other diseases.
- Low levels of CD4 cells make it harder for the body to stop or control infections and diseases.
- HIV is most commonly spread through:
    - Sexual contact with an HIV-infected person, especially vaginal or anal sex.

- Transfer of HIV from a mother to child during pregnancy, childbirth, or breastfeeding.
- HIV-contaminated needle.

Bacteria	Cholera, Leprosy, Tuberculosis, Plague, Syphilis.
Fungus	Ringworm, Candidiasis, Cryptococcosis, Aspergillosis, Histoplasmosis.
Water	Diarrhea, Dysentery, Amebiasis, Hepatitis, Gastroenteritis.

10. An astronaut from the moon's surface will observe the sky as:

A blue

B red

C **black**

D white

Solution

- Light scattering occurs when a parallel beam of light passes through a gas and a portion of it appears in directions other than the incident direction.
- This is referred to as light scattering.
- The basic idea behind light scattering is that light is absorbed by molecules and then re-radiated in different directions.
- Red light scatters the least, while violet light scatters the most.
- Scattering of light causes the blue colour of sky and the reddening of the Sun at sunrise and sunset.

11. Which of the following terms is used for the expression '$\overline{C}$' in the consumption function?

A Average propensity to consume

B **Autonomous Consumption**

C Marginal propensity to consume

D Induced consumption

Solution

- $\overline{C}$ in the consumption function represents consumption that does not depend on current income levels.
- This type of consumption is known as Autonomous Consumption.
- Autonomous Consumption is the part of consumption expenditure that would occur even if the consumer had zero income.
- It is a key component in the Keynesian consumption function, which is expressed as $C = \overline{C} + cY$, where c is the marginal propensity to consume and Y is the income.

Term	Description
Autonomous Consumption	The level of consumption that would still occur even if a consumer had no income.
Marginal Propensity to Consume (MPC)	The fraction of additional income that is spent on consumption.
Average Propensity to Consume (APC)	The ratio of total consumption to total income.
Induced Consumption	Consumption that varies with the level of income.

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

28 : 2 :: 126 : 4 :: 65 : ?

A 7

B 6

C 5

D 3

Solution

Logic:

- $(\text{2nd number} + 1)^3 + 1 = \text{1st number}$
- For, 28 : 2

  $\Rightarrow (2 + 1)^3 + 1 = 3^3 + 1 = 27 + 1 = 28$
- For, 126 : 4

  $\Rightarrow (4 + 1)^3 + 1 = 5^3 + 1 = 125 + 1 = 126$
- Similarly, for 65 : ?

  $\Rightarrow (\text{2nd number} + 1)^3 + 1 = 65$

$$\Rightarrow (\text{2nd number} + 1)^3 = 65 - 1$$

$$\Rightarrow \text{2nd number} + 1 = 3\sqrt{64}$$

$$\Rightarrow \text{2nd number} + 1 = 4$$

$$\Rightarrow \text{2nd number} = 4 - 1$$

$$\Rightarrow \text{2nd number} = 3$$

13. Which of the following enzymes in the saliva breaks down starch which is a complex molecule to give simple sugar?

A Salivary trypsin

B Salivary pepsin

C Salivary amylase

D Salivary lipase

Solution

- Starch is a complex carbohydrate that needs to be broken down into simple sugars for the body to use it as energy.
- Amylase is the enzyme responsible for breaking down starch into simple sugars like glucose and maltose.
- The majority of amylase in your body is produced by the salivary glands and pancreas.
- Pepsin is an enzyme produced in the stomach. It breaks down proteins into amino acids.
- Trypsin is an enzyme produced in the pancreas. It breaks down proteins into smaller peptides.
- Lipase is an enzyme that breaks down fats into fatty acids and glycerol.

14. Which of the following statements is INCORRECT?

a) Methanoic acid is secreted by Nettle plant leaves.

b) Acetic acid is found in vinegar.

c) Tooth decay starts when mouth pH is lower than 5.5.

d) Bacteria present in the mouth produces base by degradation of the remaining food particles present in the mouth.

A a

B b

C c

D **d**

Solution

- Methanoic acid is indeed secreted by Nettle plant leaves. It is one of the substances that cause the stinging sensation when a person comes into contact with the nettles. Hence, Statement 1 is correct.
- Acetic acid is the main component of vinegar, contributing to its characteristic sour taste and pungent smell. Therefore, Statement 2 is correct.
- Tooth decay is known to begin when the pH in the mouth drops below 5.5. At this acidity level, the enamel on the teeth begins to

demineralize, leading to decay. Thus, Statement 3 is correct.

- Bacteria in the mouth typically produce acid from the fermentation of food particles, not base. This acid contributes to tooth decay by lowering the pH of the mouth. Consequently, Statement 4 is incorrect.

15. **The value of $\sqrt{1+\left(\frac{1-\tan A}{1-\cot A}\right)^2}$ is:**

A cot A

B tan A

C cos A

D sec A

Solution

Formula Used:

- $\tan A = \frac{1}{\cot A}$ and $\sec^2 A = 1 + \tan^2 A$

Calculation:

- Let's simplify the expression inside the square root:

$$\sqrt{1+\left(\frac{1-\tan A}{1-\frac{1}{\tan A}}\right)^2}$$

$$\sqrt{1+\left(\frac{\tan^2 A-1}{\tan A-1}\right)^2}$$

$$\sqrt{1+\left(\frac{(\tan A+1)(\tan A-1)}{\tan A-1}\right)^2}$$

$$\sqrt{1+\tan^2 A}$$

⇒ sec A

- ∴ The value of the given expression is sec A.

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

48, 52, 26, 30, 15, ?

A 18

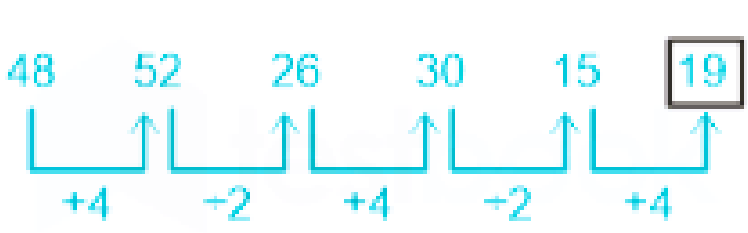
B 20

C **19**

D 17

Solution

- The logic followed here is:



- So, '19' will replace the question mark in the given series.

17. Express $0.5\overline{323}$ in the form $\frac{p}{q}$, where p and q are integers and q ≠ 0.

A $\frac{5323}{9990}$

B $\frac{2661}{4990}$

C $\frac{2659}{4995}$

D $\frac{5333}{9990}$

Solution

- Here,

$$\frac{5323-5}{9990} = \frac{5318}{9990}$$

$$= \frac{2659}{4995}$$

- ∴ The correct answer is $\frac{2659}{4995}$.

18. The sum of the present ages of Ram, Nikhil and Aswin is 111 years. Ten years ago, the ratio of their ages was 2 : 3 : 4. What is the present age (in years) of Nikhil?

A 16

B 44

C **37**

D 28

Solution

Formula Used:

- If the present ages are A, B, and C, then A + B + C = Sum of present ages.
- Let's assume the ages of Ram, Nikhil, and Aswin 10 years ago were 2x, 3x, and 4x years respectively.

Calculation:

- Present ages of Ram, Nikhil, and Aswin = (2x + 10), (3x + 10), and (4x + 10) respectively.
- Sum of present ages = (2x + 10) + (3x + 10) + (4x + 10) = 111

$\Rightarrow 9x + 30 = 111$

$\Rightarrow 9x = 81$

$\Rightarrow x = 9$

- Nikhil's present age = $3x + 10 = 3 \times 9 + 10 = 27 + 10 = 37$ years

19. Most popularly celebrated in Maharashtra and Gujarat, the Parsi New Year is known as _____ and marks the beginning of the Iranian calendar.

A Navreh

B Bestu Varas

C **Nowruz**

D Losoong

Solution

- The festival of Navroz (or Nowruz) is celebrated as the New Year by the Parsi community.
- Parsis follow Zoroastrianism, which was founded in ancient Persia (now Iran).
- Navroz, or Nowruz, means "new day" and it marks the first day of the Persian calendar.
- It usually falls on March 21, symbolizing the renewal of nature and life.
- The festival is marked by feasting, praying, and meeting family and friends.

20. Five runners are standing in a straight row facing the east. Runner K is standing at the first position and M is at the end position. L is standing to the immediate left of N, and N is standing to the immediate left of M. P is standing third to the left of M. Who is standing to the immediate left of P?

A M

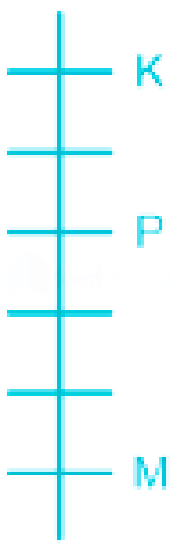
B L

C **K**

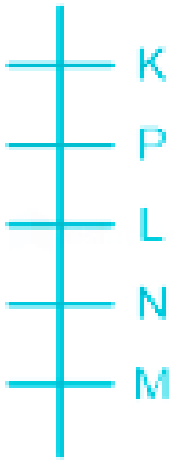
D N

Solution

- Runner K is standing at the first position and M is at the end position.
- P is standing third to the left of M.



- L is standing to the immediate left of N, and N is standing to the immediate left of M.



- So, 'K' is standing to the immediate left of P.

21. The state of Rajasthan regained its lost greenery due to which canal?

A Sirhind Canal

B Munak Canal

C Agra Canal

D Indira Gandhi Canal

Solution

- ndira Gandhi Canal is the longest in India.
- It begins at Harike Barrage in Harike, a few kilometers below the confluence of the Sutlej and Beas rivers in the Indian state of Punjab, and ends at irrigation facilities in the Thar Desert in the northwest of the state of Rajasthan.
- Previously known as the Rajasthan Canal, it was renamed Indira Gandhi Canal on 2 November 1984 after the assassination of Prime Minister Indira Gandhi.
- The state receives much water from the rivers of Punjab, from the Western Yamuna Canal in Haryana and the Agra Canal in Uttar Pradesh, and from the Sabarmati and Narmada Sagar projects in Gujarat and Madhya Pradesh, respectively.

22. Which of the following components are necessary for photosynthesis?

A Oxygen, water, sunlight and chlorophyll

B Carbon dioxide, water, sunlight and oxygen

C Carbon dioxide, water, sunlight and chlorophyll

D Carbon dioxide, water, Oxygen and chlorophyll

Solution

- The process by which plants make their own food in the presence of sunlight, carbon dioxide present in air, water, minerals, and chlorophyll present in leaves is termed photosynthesis.
- Components which are necessary for photosynthesis are Carbon dioxide, water, sunlight and chlorophyll.
- Carbon dioxide from air is taken in through the tiny pores present on the surface of the leaves.
- These pores are surrounded by ‘guard cells’. Such pores are called stomata.
- Water and minerals are transported to the leaves by the vessels which run like pipes throughout the root, the stem, the branches, and the leaves.
- The leaves have a green pigment called chlorophyll. It helps leaves to capture the energy of the sunlight.

- This energy is used to synthesize (prepare) food from carbon dioxide and water.

23. If the volume of a solid cube is 216 cm^3, then its total surface area (in cm^2) is _____.

A 216

B 6

C 36

D 38

Solution

Formula Used:

- Volume of cube = $Side^3$
- Total surface area of cube = 6 × $Side^2$

Calculation:

- $Side^3$ = 216

  ⇒ Side = 6 cm

- Total surface area = 6 × $Side^2$

  ⇒ Total surface area = 6 × 6^2 = 6 × 36

  ⇒ Total surface area = 216 cm^2

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

17, 19, 21, 19, 25, 19, ?

A 29

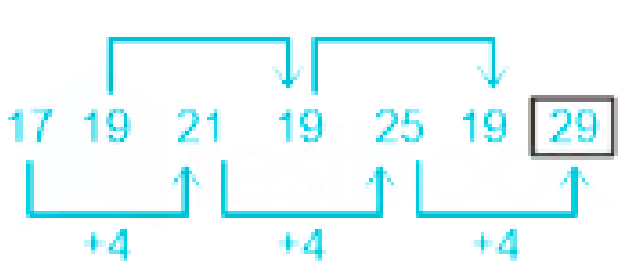
B 32

C 27

D 30

Solution

- The logic followed here is:



- So, '29' will replace the question mark in the given series.

25. The smallest 1-digit number to be added to the 6-digit number 234492 so that it is completely divisible by 11 is:

A 7

B 6

C 4

D 5

Solution

Formula Used:

- For a number to be divisible by 11, the difference between the sum of its digits at odd places and the sum of its digits at even places should be either 0 or a multiple of 11.

Calculation:

- **Option A) 234492 + 7 = 234499**

  Odd places digits: 2, 4, 9 => Sum = 2 + 4 + 9 = 15

  Even places digits: 3, 4, 9 => Sum = 3 + 4 + 9 = 16

  ⇒ Difference = 16 - 1 = 15

- **Option B) 234492 + 6 = 234498**

Odd places digits: 2, 4, 9 => Sum = 2 + 4 + 9 = 15

Even places digits: 3, 4, 9 => Sum = 3 + 4 + 8 = 15

⇒ Difference = 15 - 15 = 0

- ∴ The smallest 1-digit number to be added is 6.

26. In a triangle PQR, ∠P = 30° and the straight line UV is drawn parallel to QR, intersecting PQ at S and PR at T. Which of the following is always true?

a) $\frac{PS}{PQ} = \frac{PT}{PR}$

b) ST $= \frac{QR}{2}$

c) The triangle PST is similar to the triangle PQR.

A Only (a) and (b)

B Only (a) and (c)

C Only (a)

D All of (a), (b) and (c)

Solution

Formula Used:

- Basic proportionality theorem (Thales theorem) which states that if a line is drawn parallel to one side of a triangle to intersect the other two sides at two distinct points, the other two sides are divided in the same ratio.

- The Angle-Angle similarity postulate (AA postulate) states that two triangles are similar if they have two corresponding angles that are congruent.

Calculation:

- Since, UV is parallel to QR and intersects PQ at S and PR at T, by the basic proportionality theorem,

  $\Rightarrow \frac{PS}{PQ} = \frac{PT}{PR}$

- Also, since UV is parallel to QR, ∠P is common, and ∠Q = ∠S, ∠R = ∠T by corresponding angles, triangle PST is similar to triangle PQR by AA postulate.

- However, without the specific measurements of QR or the other angles, we cannot directly conclude ST = $\frac{QR}{2}$ without additional information. This is a specific ratio that depends on the lengths of QR and ST, which are not provided directly through the given information or theorems.

27. The Vikram Sarabhai Journalism Award is given in the field of _____.

A Atomic Energy Research

B Medical Science Research

C Health and Physical Education Research

D Space Science, Technology and Research

Solution

- The Vikram Sarabhai Journalism Award is awarded to recognize outstanding journalistic work in the field of space science, technology, and research.
- It is named after Dr. Vikram Sarabhai, who is widely regarded as the father of the Indian space program.
- The award aims to encourage and acknowledge comprehensive and objective reporting in space science.
- Recipients of this award are honored for their significant contribution to the dissemination of information about space activities to the public.
- Dr. Vikram Sarabhai was an Indian scientist and innovator widely regarded as the pioneer of the Indian space program.

- He was instrumental in establishing the Indian Space Research Organisation (ISRO) in 1969.

28. Dialysis is the procedure done to remove the waste products from the blood when the normal functioning of kidneys is affected. The steps of dialysis are given below but not in the proper order. Which option shows the correct sequence of these steps?

a) Line to vein

b) Patient's blood passed through a tank with dialysing fluid

c) Line from artery

d) Waste products from the blood pass into dialysing fluid

e) Dialysing fluid has same osmotic pressure as blood except the wastes

A c---b---d---a---e

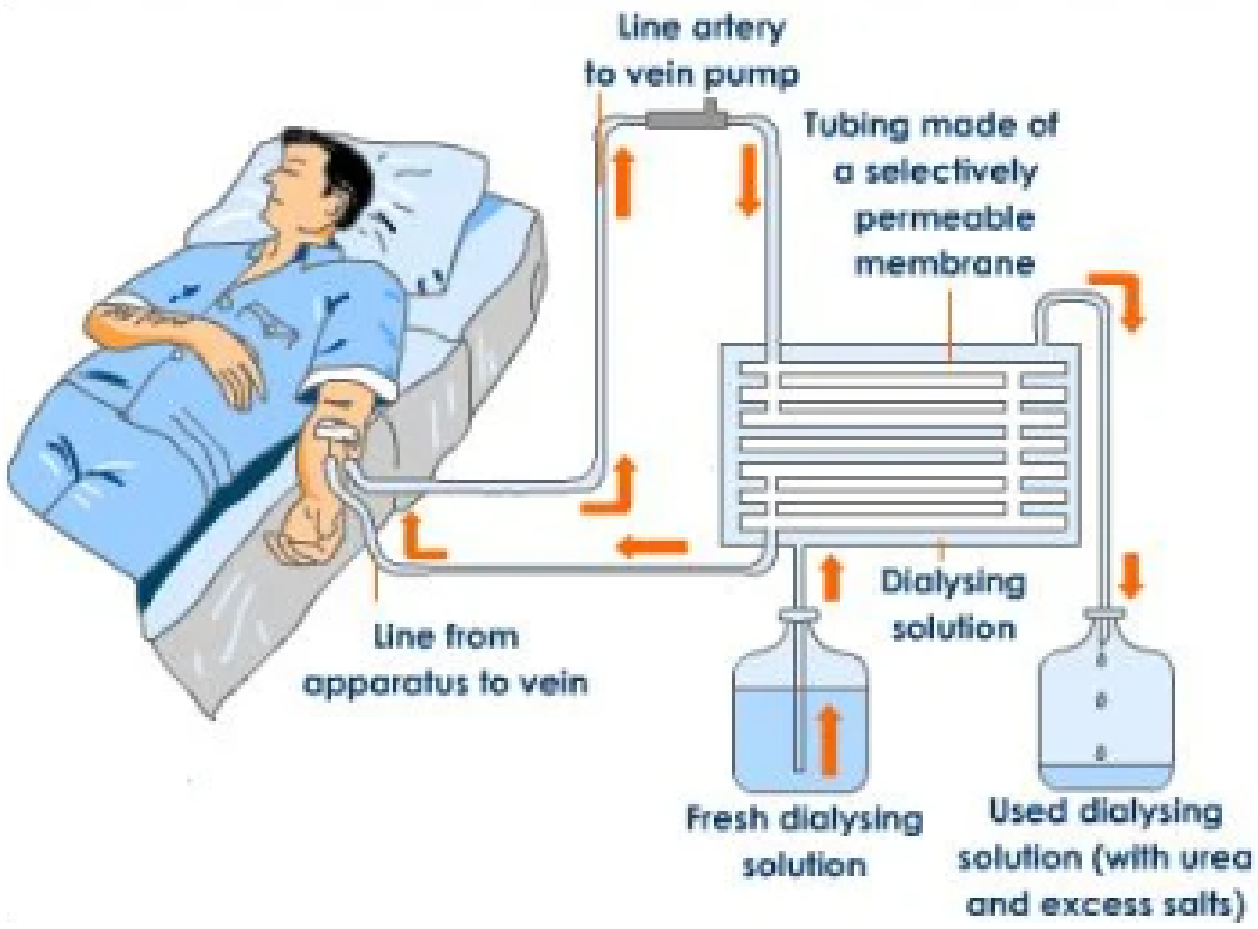
B **c---b---e---d---a**

C a---c---d---b---e

D a---b---c---d---e

Solution

- Dialysis is a procedure to remove waste products and excess fluid from the blood when the kidneys stop working properly. It often involves diverting blood to a machine to be cleaned.



- There are 2 main types of dialysis: Haemodialysis and Peritoneal dialysis.

29. As of March 2022, who is the Union Minister of Rural Development & Panchayati Raj?

A Mansukh L Mandaviya

B Giriraj Singh

C Dharmendra Pradhan

D Pralhad Joshi

Solution

- Giriraj Singh was the Union Minister of Rural Development & Panchayati Raj as of March 2022.
- This ministry is crucial for implementing schemes and policies aimed at enhancing rural infrastructure, livelihood, and governance.
- Union Minister Shri Shivraj Singh Chouhan and Minister of State Shri Kamlesh Paswan officially takes charge of Ministry of Rural Development at Krishi Bhawan, New Delhi on 11th June, 2024.

30. The speed of a bus increases by 4 km/h after every two hours. If the bus covers a distance of 80 km in the first two hours, then the total distance covered by the bus in 10 hours will be:

A 470 km

B 480 km

C 460 km

D 440 km

Solution

Formula Used:

- Distance = Speed × Time

Calculation:

- For the first 2 hours, Distance = 80 km

  ⇒ For the next 2 hours (3rd and 4th hour), Speed = 40 km/h + 4 km/h = 44 km/h

- Distance = 44 km/h × 2 = 88 km

  ⇒ For the 5th and 6th hour, Speed = 44 km/h + 4 km/h = 48 km/h,

- Distance = 48 km/h × 2 = 96 km

⇒ For the 7th and 8th hour, Speed = 48 km/h + 4 km/h = 52 km/h,

- Distance = 52 km/h × 2 = 104 km

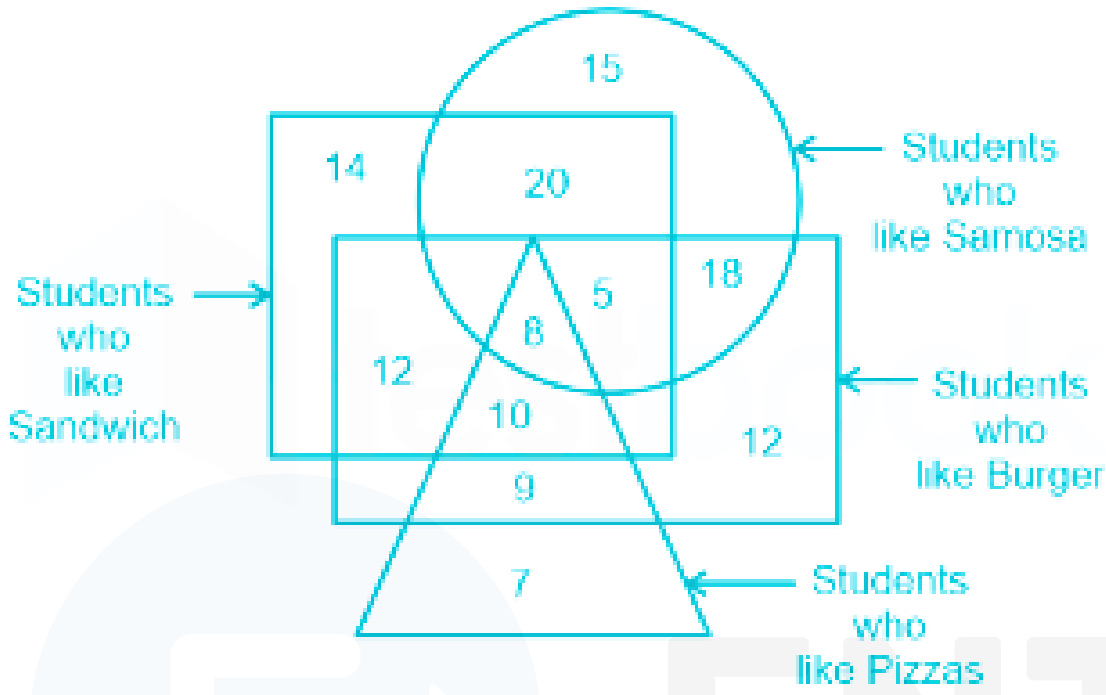
⇒ For the 9th and 10th hour, Speed = 52 km/h + 4 km/h = 56 km/h,

- Distance = 56 km/h × 2 = 112 km

⇒ Total Distance covered in 10 hours = 80 km + 88 km + 96 km + 104 km + 112 km

⇒ Total Distance = 480 km

31. Study the given diagram carefully and answer the question. The numbers in different sections indicate the number of students surveyed regarding types of snacks they like to have in the college canteen.



How many students like both Samosa and Burger?

A 23

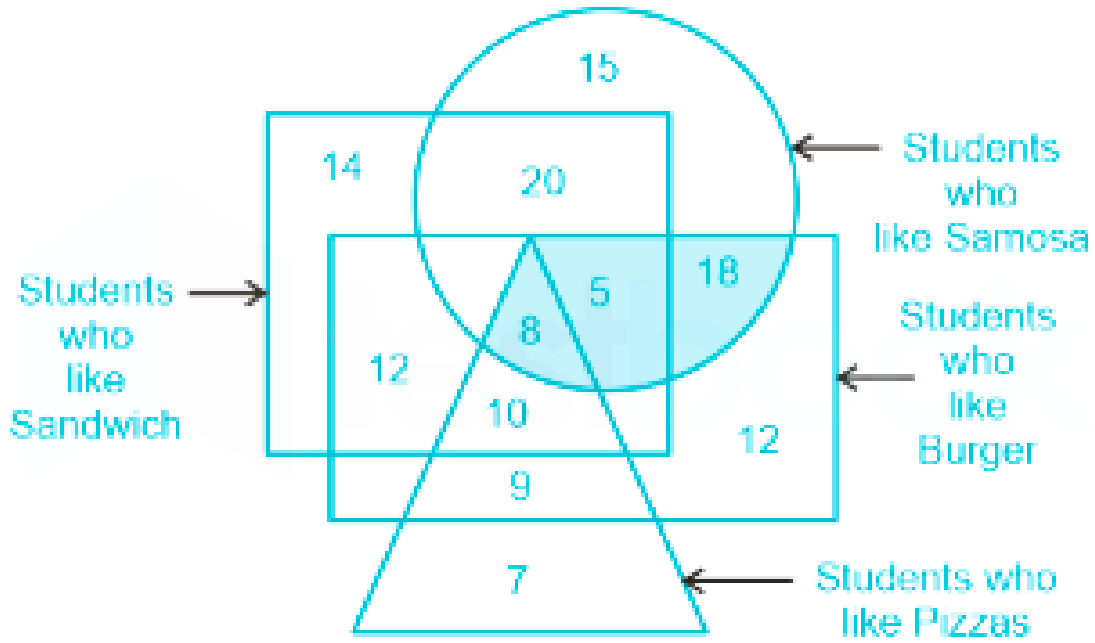
B 13

C 18

D **31**

Solution

- According to the given Venn diagram:



- The shaded area shows the "total number of students like both Samosa and Burger".

- So, the total number of students like both Samosa and Burger = 8 + 5 + 18 = 31

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

17 : 38 :: 23 : 50 :: 12 : ?

A 28

B 39

C 33

D 35

Solution

Logic:

- (1st number × 2) + 4 = 2nd number
- For, 17 : 38

  ⇒ (17 × 2) + 4 = 34 + 4 = 38
- For, 23 : 50

  ⇒ (23 × 2) + 4 = 46 + 4 = 50
- Similarly, for 12 : ?

  ⇒ (12 × 2) + 4 = 24 + 4 = 28

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

2 - 4 × 25 + 13 ÷ 2 = ?

A **-0.5**

B 3

C 0.5

D -1

Solution

- Decoding the given information:

Symbol	+	-	×	÷
Meaning	-	÷	+	×

- Given Equation: 2 - 4 × 25 + 13 ÷ 2 = ?
- Now replacing the signs from left to right using the BODMAS Rule, we get:
- New Equation: 2 ÷ 4 + 25 - 13 × 2 = ?
- Applying the BODMAS Rule:

→ 2 ÷ 4 + 25 - 13 × 2 = ?

$\rightarrow 0.5 + 25 - 13 \times 2 = ?$

$\rightarrow 0.5 + 25 - 26 = ?$

$\rightarrow 25.5 - 26 = -0.5$

34. Ashish sold a cow to Bipin for Rs. 5,000 by losing 20%. Bipin sold it to Kasim at that price which would have given Ashish a profit of 15%. What is Bipin's gain in this transaction?

A Rs. 1,250.00

B Rs. 2,100.00

C Rs. 937.50

D Rs. 2,187.50

Solution

- Let the cost price for Ashish be Rs. x.
- Ashish sold the cow at a loss of 20%.

$$\Rightarrow 5000 = \frac{80}{100} \times x \Rightarrow x = \frac{5000 \times 100}{80} = 6250$$

- To gain a profit of 15%, the selling price for Ashish would have been:

$$\Rightarrow \frac{115}{100} \times 6250 = 7187.50$$

- So, Bipin sold it to Kasim for Rs. 7187.50.
- Bipin's gain = Selling price - His purchase price

= 7187.50 - 5000 = 2187.50

- ∴ Bipin's gain in this transaction is Rs. 2,187.50.

35. **Refer to the following letter, number, symbol series and answer the question that follows.**

(Left) 4 # O $ 5 T F 8 % U 2 P A & F Ø 3 @ T 4 ¥ I # H (Right)

How many such symbols are there in the above series each of which is immediately followed by a vowel and also immediately preceded by a number?

A 2

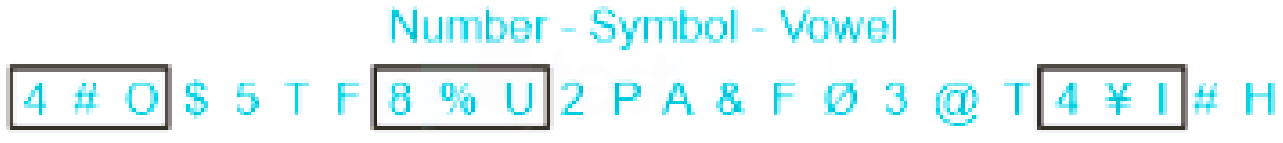
B 1

C 4

D **3**

Solution

- Symbols immediately followed by a vowel and also immediately preceded by a number.
- So, the pattern needed is: Number - Symbol - Vowel



- So, there are 'Three' pairs i.e. '4#O, 8%U, 4¥I'.

36. If each of the letters in the word MIRACLE is arranged in alphabetical order, then how many letters are there in the English alphabetical series between the letter which is third from the left and the one which is third from the right in the new arrangement?

A Three

B Five

C **Six**

D Four

Solution

- After arranged in alphabetical order:

Alphabets	M	I	R	A	C	L	E
Alphabetical order	A	C	E	I	L	M	R

- After arranged in alphabetical order,

  → Third alphabet from the left end is: E

  → Third alphabet from the right end is: L

- Now, there are 6 letters between E and L.

E	F	G	H	I	J	K	L

- Hence, the correct answer is "Option C".

37. If 16 : y :: y : 25, find the positive value of y.

A 15

B 20

C 18

D 10

Solution

Formula Used:

- a : b : c : d implies a × d = b × c.

Calculation:

- According to the given proportion, 16 : y :: y : 25

⇒ 16 × 25 = y × y

⇒ $400 = y^2$

⇒ $y^2 = 400$

⇒ y = √400

⇒ y = 20

38. The value of x in the proportion equation 5 :12 :: 9 : x is:

A **21.6**

B 20.4

C 20.6

D 21.4

Solution

Formula Used:

- In the proportion a : b :: c : d, a × d = b × c

Calculation:

- Using the proportion 5 : 12 :: 9 : x

$\Rightarrow 5 \times x = 12 \times 9$

$\Rightarrow 5x = 108$

$\Rightarrow x = \frac{108}{5}$

$\Rightarrow x = 21.6$

39. Six boxes, A, B, C, P, U and V, are kept one over the other, but not necessarily in the same order. B is the top-most box, and C is immediately below B. There are only two boxes between B and V. There are only three boxes between P and C. There is only one box below U. Which box is kept immediately below U?

A V

B P

C C

D A

Solution

- B is the top-most box, and C is immediately below B.
- There are only two boxes between B and V.

- There are only three boxes between P and C.

- There is only one box below U.
- And, A will place on the remaining space.

B
C
A
V
U
P

- After arranging the boxes, the box immediately below U is P.

40. Two statement are given below, followed by four conclusions given in the options. Find out which conclusion is true based on the given statements.

Statement: A > C = B, M > N > O > P > Q = A

A O < B

B **B < M**

C N < C

D C > N

Solution

Conclusions:

- Option A: O < B → False (O > P > Q = A > C = B It gives O > B).
- Option B: B < M → True (M > N > O > P > Q = A > C = B It gives M > B).
- Option C: N < C → False (M > N > O > P > Q = A > C It gives N > C).
- Option D: C > N → False (M > N > O > P > Q = A > C It gives N > C).

41. **Amongst six girls-A, C, F, H, J and K, each has a different height. They are standing in the ascending order of their heights, shortest in the front and tallest at the back. C is at the beginning of the queue. There is only one person taller than F. H is immediately taller than A. Both C and H are shorter than K. There is only one other person between A and C. If H and F are at the fourth and the fifth places from the start of the queue, respectively in the queue, then who is second from the beginning of the queue?**

A J

B C

C K

D A

Solution

- C is at the beginning of the queue.

  C < __ < __ < __ < __ < __

- There is only one person taller than F.

  C < __ < __ < __ < F < __

- H is immediately taller than A.

- There is only one other person between A and C.

  C < __ < A < H < F < __

- Both C and H are shorter than K.

  C < __ < A < H < F < K

- And, J will place on the remaining space.

  C < J < A < H < F < K

- Hence, the girl who is second from the beginning of the queue is J.

42. **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/Symbols	2	@	9	5	$	&	3	%	#	7	+	4	8	6
Code	T	F	A	J	L	E	W	Q	D	P	R	B	U	S

Conditions:

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

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

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

Question: 7 % 9 # 2

A Q©AD©

B ©D©QA

C ©AD©Q

D **©QAD©**

Solution

- Given:

Number/Symbols	2	@	9	5	$	&	3	%	#	7	+	4	8	6
Code	T	F	A	J	L	E	W	Q	D	P	R	B	U	S

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

- Now, the group of numbers and symbols is: '7 % 9 # 2'
- Then, codes of the First and Last elements will be coded as ©.
- Therefore, the code for '7 % 9 # 2' is → '© Q A D ©'.

43. The ages of Ram and Sita are in the ratio 5 : 8. Three years later the sum of their ages will be 58 years. The present ago of Ram is:

A 21 years

B 25 years

C **20 years**

D 22 years

Solution

Formula Used:

- If the ratio of ages of Ram and Sita is 5:8, let their ages be 5x and 8x respectively.
- Sum of ages after 3 years = (5x + 3) + (8x + 3)

Calculation:

- Here,

⇒ (5x + 3) + (8x + 3) = 58

⇒ 13x + 6 = 58

⇒ 13x = 58 - 6

$\Rightarrow 13x = 52$

$\Rightarrow x = \frac{52}{13}$

$\Rightarrow x = 4$

- So, the present age of Ram = $5x = 5 \times 4 = 20$ years

44. If the curved surface area of a right circular cylinder is 880 cm^2 and the diameter of its base is 7 cm, then the height (in cm) the cylinder is:

Take $\pi = \frac{22}{7}$.

A 28

B 20

C **40**

D 14

Solution

Formula Used:

- Curved Surface Area = 2πrh
- $\pi = \frac{22}{7}$

Calculation:

- Radius (r) = $\frac{Diameter}{2} = \frac{7}{2} = 3.5$ cm

  $\Rightarrow 880 = 2 \times \frac{22}{7} \times 3.5 \times h$

  $\Rightarrow 880 = 22 \times h$

$$\Rightarrow h = \frac{880}{22}$$

$$\Rightarrow h = 40 \text{ cm}$$

45. 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	*	2	@	5	^	+	7	#	%	9	4
Letter code	J	P	A	F	D	N	R	K	M	Z	B

Conditions:

(i) If both first and fourth elements are even numbers, the third element is to be coded as the code for the third element

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

Which one of the following would be the code for %94#2?

A MBZKP

B **MZZKP**

C MZBKP

D MBZPK

Solution

- Given:

Number/symbol	*	2	@	5	^	+	7	#	%	9	4
Letter code	J	P	A	F	D	N	R	K	M	Z	B

Conditions	Coded As
Both First and fourth elements are even numbers	Third element is to be coded as the code for the third element
Both second and third elements are perfect squares	Third element is to be coded as the code for the second element

- Now, the group of numbers and symbols is: '%94#2'
- Then, third element is to be coded as the code for the second element.
- Therefore, the code for '%94#2' is → 'MZZKP'.

46. As per the report of Stockholm International Peace Research Institute (SIPRI) titled 'Trends in International Arms Transfers, 2021', India is the world's _____ arms importer globally.

A second largest

B largest

C third largest

D fourth largest

Solution

- India was ranked as the second-largest arms importer globally according to the SIPRI report titled 'Trends in International Arms Transfers, 2021'.
- This position indicates India's significant reliance on foreign sources for its military hardware.
- The country's vast imports are driven by its needs to modernize its military forces and enhance its defense capabilities.
- Major suppliers to India include countries like Russia, France, and the United States, highlighting a diversified source of imports.
- The report underscores the global arms trade dynamics and how nations prioritize defense and security through arms imports and exports.

47. The value of 20 - [12 - {14 - (12 - $\overline{16 - 10}$)}] is:

A 20

B 8

C **16**

D 10

Solution

Formula Used:

- To solve the expression, follow the BODMAS rule (Bracket, Order, Division and Multiplication, Addition, and Subtraction).

Calculation:

- Given:

  ⇒ 20 - [12 - {14 - (12 - (16 - 10))}]

  ⇒ 20 - [12 - {14 - (12 - (6))}]

  ⇒ 20 - [12 - {14 - 6}]

  ⇒ 20 - [12 - 8]

  ⇒ 20 - [4]

$$\Rightarrow 20 - 4$$

$$\Rightarrow 16$$

48. **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.**

TSRA : ZIHG

OLEV : EVOL

A CRVF : VEIX

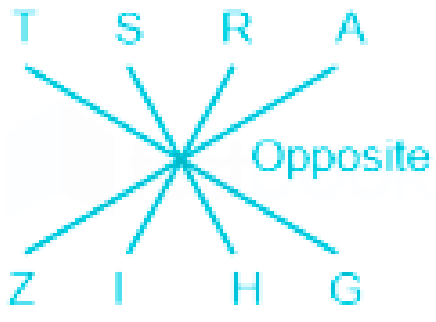
B KVRA : ZIEQ

C JPMN : ONKQ

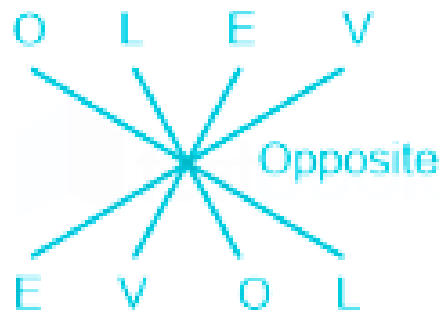
D **ARNI : RMIZ**

Solution

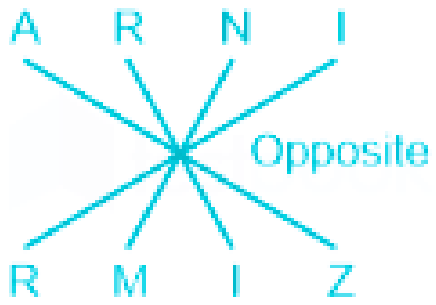
- For, TSRA : ZIHG



- For, OLEV : EVOL



- Similarly, for ARNI : RMIZ



- Hence, the correct answer is "Option D".

49. The discriminant of a quadratic equation is 0. The quadratic equation has:

A no real roots

B two distinct real roots

C three distinct real roots

D two equal real roots

Solution

Formula Used:

- The discriminant of a quadratic equation $ax^2 + bx + c = 0$ is given by $D = b^2 - 4ac$.
- If D = 0, the equation has two equal real roots.

Calculation:

- Given $D = 0_1$
- This implies the quadratic equation has two equal real roots.

50. 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	#	*	+	8	@	6	5	2	%	4	3	&	7	9
Code Letter	D	L	F	A	H	M	Q	N	C	X	W	G	T	R

Conditions:

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

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

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

What will be the code for 3 & % 4 6?

A WGCXM

B ©GCX©

C ©GCX#

D WQLT©

Solution

- Given:

Number/symbol	#	*	+	8	@	6	5	2	%	4	3	&	7	9
Code Letter	D	L	F	A	H	M	Q	N	C	X	W	G	T	R

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

- Now, the group of numbers and symbols is: '3 & % 4 6'
- Then, codes of the First and Last elements will be coded as ©.
- Therefore, the code for '3 & % 4 6' is → '© G C X ©'.

51. The ratio of $9^{3.5} : 3^5$ is the same as:

A $1 : 7$

B $7 : 1$

C $1 : 14$

D **$9 : 1$**

Solution

- Here,

$$9^{3.5} : 3^5 = (3^2)^{3.5} : 3^5$$

$$= (3)^{2\times 3.5} : 3^5$$

$$= (3)^7 : 3^5$$

$$= (3)^{7-5} : 1$$

$$= (3)^2 : 1$$

$$= 9 : 1$$

52. The functional group which has more than one oxygen atom is:

A Alcohol

B Aldehyde

C **Carboxylic acid**

D Ketone

Solution

- Carboxylic acids contain a carboxyl group (–COOH), which includes two oxygen atoms: one in a hydroxyl group and the other in a carbonyl group.
- Carboxylic acids are more acidic than alcohols, aldehydes, and ketones due to the presence of this functional group.
- The presence of two oxygen atoms in carboxylic acids increases their ability to form hydrogen bonds, making them more soluble in water compared to other organic compounds with similar molecular weights.
- Carboxylic acids are commonly found in biological systems and are important in various chemical industries.

53. Which river of Rajasthan had dried up but revived with efforts of the villagers assisted by Tarun Bharat Sangh, an NGO?

A Luni River

B Arvari River

C Saraswati River

D Bhagirathi River

Solution

- The Arvari River, which had dried up, was successfully revived through the efforts of local villagers and the NGO Tarun Bharat Sangh.

Option	Details
Luni River	A seasonal river in Rajasthan, known for its saline nature in the lower reaches.
Saraswati River	A mythological river mentioned in ancient Indian texts, believed to have existed in the past.
Bhagirathi River	One of the source streams of the Ganges, originating from the Gangotri Glacier in Uttarakhand.

54. AD is the altitude of an isosceles triangle ABC in which AB = AC. Which of the following is true for AD?

A AD bisects ∠ C

B AD bisects ∠ B

C AD does not bisect ∠ A

D AD bisects ∠ A

Solution

Formula Used:

- In an isosceles triangle, the altitude to the base also bisects the vertex angle.

Calculation:

- Since, AB = AC, triangle ABC is isosceles with base BC.

  ⇒ AD is the altitude from A to BC.

- By the property of isosceles triangles, AD not only acts as an altitude but also bisects the angle at A.

  ⇒ AD bisects ∠A

55. If $5^{x+y} = 125$ and $5^{x-y} = 3125$, then the value of y is:

A -2

B **-1**

C -3

D -4

Solution

- Here,

  $5^{x+y} = 125$

  $= 5^{x+y} = 5^3$

  $5^{x-y} = 3125$

  $= 5^{x-y} = 5^5$

- So,

  x + y = 3 → equation 1

  x - y = 5 → equation 2

- From equation 1 and 2,

  2x = 8

  x = $\frac{8}{2}$

$x = 4$

- Put value of $x = 4$ in equation 1,

$4 + y = 3$

$y = 3 - 4$

$= -1$

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

MSN15, QWR18, UAV21, YEZ24,?

A **CID27**

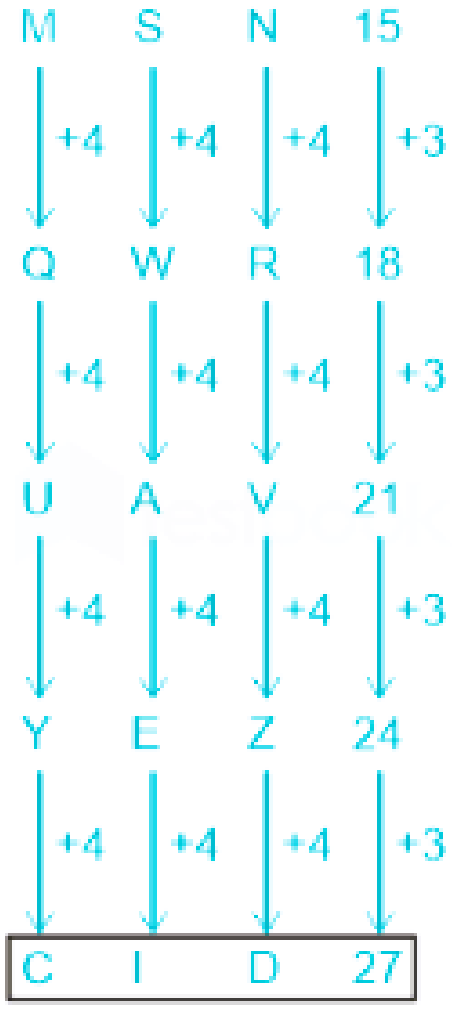
B CJL31

C DNS31

D DBC27

Solution

- The logic followed here is:



- So, 'CID27' will replace the question mark in the given series.

57. Why should we human beings reduce our dependence on petroleum products?

A Petroleum needs to be refined

B Amount of petroleum is finite

C Petroleum is very expensive

D Petroleum needs to be imported

Solution

- Petroleum is a non-renewable resource, meaning it cannot be replenished naturally at the rate we consume it.
- The extraction and burning of petroleum products release significant amounts of greenhouse gases, contributing to climate change.
- Dependence on petroleum makes economies vulnerable to price fluctuations and supply disruptions.
- Reducing reliance on petroleum can promote the development and adoption of cleaner, sustainable energy sources.

58. What was the historic contribution of the community of Amrita Devi Bishnoi in Rajasthan in the 1700s?

A

They dug several ponds to capture rainwater and stopped desertification of the region.

B

They laid down their lives to stop the cutting down of trees growing in their region.

C They set up the first wildlife sanctuary to protect deer from hunters.

D

They planted thousands of Khejri trees and stopped desertification of the region.

Solution

- The Bishnoi community of Rajasthan, led by Amrita Devi Bishnoi, is known for their commitment to protecting trees and wildlife.
- In 1730, the Maharaja of Jodhpur sent soldiers to cut down trees in the region for a new palace. Amrita Devi and her community opposed the cutting of trees, as they considered them sacred.
- Amrita Devi Bishnoi and 362 other members of her community sacrificed their lives to protect the trees by hugging them, a method that is now known as "Chipko Movement" in modern environmental campaigns.

- This event is one of the earliest examples of non-violent environmental protest in India and has inspired generations to protect nature.

59. The Board of Control for Cricket in India (BCCI) has finalised a Central Contracts list for the 2022-23 season for Indian cricketers. Which of the following senior players has lost the Grade A status in 2022?

A Virat Kohli

B Jasprit Bumrah

C Rohit Sharma

D Chateshwar Pujara

Solution

- Grade A status in BCCI contracts represents a high level of remuneration and benefits for the players included.
- Cheteshwar Pujara is known for his solid technique and has been a key player in India's Test match setup.
- The central contracts list is updated annually by the BCCI, reflecting players' performances and potential contributions to the team.
- Players losing Grade A status might be due to various factors including form, fitness, and team composition needs.

60. What is the quadratic equation whose roots are 2 and $\frac{-1}{2}$?

A $2x^2$ - 3x - 4 = 0

B $2x^2$ - 3x - 1 = 0

C $2x^2$ - 3x - 2 = 0

D $2x^2$ - 3x - 3 = 0

Solution

Formula Used:

- x^2 - (Sum of roots)x + (Product of the roots) = 0

Calculation:

- Sum of the roots = $2 + \frac{-1}{2} = \frac{3}{2}$
- Product of the roots = $2 \times \frac{-1}{2}$ = -1
- Equation form: $x^2 - \frac{3}{2}x - 1 = 0$
- To remove the fraction, multiply the whole equation by 2:

$2x^2$ - 3x - 2 = 0

61. The limit of 'Shishu' loan that is granted under Micro Units Development & Refinance Agency (MUDRA) is:

A Rs. 50,000 to Rs. 5 lakh

B up to Rs. 50 lakh

C Rs. 5 lakh to Rs. 10 lakh

D up to Rs. 50,000

Solution

- The Micro Units Development & Refinance Agency (MUDRA) was launched by the Government of India in 2015.
- MUDRA provides refinancing support to banks and microfinance institutions to encourage them to finance micro units.
- The Shishu loan under MUDRA is designed for entrepreneurs who are in the earliest stage of starting a business.
- It offers loans up to Rs. 50,000 to help small businesses get off the ground.
- This category is part of the broader MUDRA scheme, which also includes Kishore and Tarun for higher loan amounts.
- The aim is to provide financial support to micro-enterprises and individuals to promote entrepreneurship.

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

17 ÷ 3 - 2 + 12 × 4 = ?

A 21

B 15

C 18

D 20

Solution

- Decoding the given information:

Symbol	+	-	×	÷
Meaning	-	×	÷	+

- New Equation: 17 + 3 × 2 - 12 ÷ 4 = ?
- Applying the BODMAS Rule, we first perform the division and multiplication:

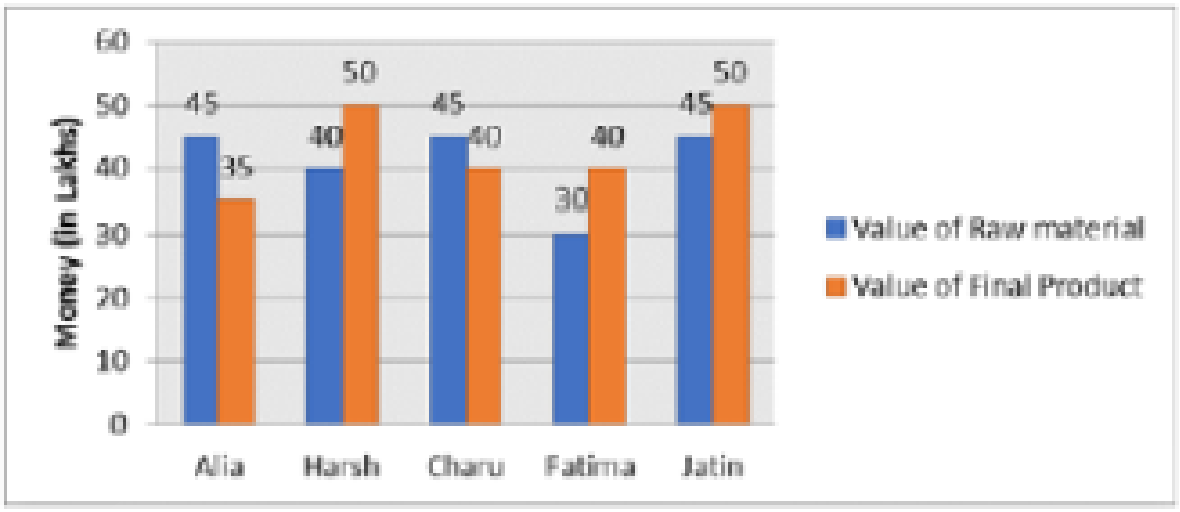
→ 17 + 3 × 2 - 12 ÷ 4 = ?

→ 17 + 3 × 2 - 3 = ?

→ 17 + 6 - 3 = ?

$$\rightarrow 23 - 3 = 20$$

63. The value of raw material and the value of final products manufactured by five people are shown in the following graph. Study the graph and answer the question.



Which manufacturer among the following has the maximum percentage increase in the value of final product as compared to the value of raw material, and by how much (approx.)?

A Harsh, 33%

B Fatima, 25%

C **Fatima, 33%**

D Harsh, 25%

Solution

Formula Used:

- Percentage Increase $= \frac{\text{Final Value - Initial value}}{\text{Initial value}} \times 100$

Calculation:

- For Fatima:

  ⇒ Percentage Increase for Fatima = (40 - 30) ÷ 30 × 100 = 33.33%

- For Harsh:

  ⇒ Percentage Increase for Fatima = (50 - 40) ÷ 40 × 100 = 25%

- ∴ Fatima has the maximum percentage increase in the value of the final product as compared to the value of raw material by approximately 33%.

64. The British introduced the concept of _____ in 1850, which significantly influenced the structure of the Indian economy.

A waterways

B airways

C roadways

D railways

Solution

- The British introduced the concept of railways in India in 1850 to improve the transportation system and facilitate the movement of goods and people across the vast country.
- The first passenger train journey took place on April 16, 1853, covering a distance of 34 kilometers from Bombay (now Mumbai) to Thane.
- Railways played a crucial role in the economic development of India, but they were also designed to serve the colonial interests, including the control of resources and military mobility.
- The introduction of railways significantly influenced the structure of the Indian economy by integrating markets, promoting trade, and encouraging the commercialization of agriculture.

65. Find the smallest natural number that can be divided by the first five 2-digit positive even numbers without leaving a remainder.

A 5560

B **5040**

C 5340

D 5120

Solution

Formula Used:

- The smallest number that can be divided by each of the first five 2-digit positive even numbers without leaving a remainder is found by calculating the Least Common Multiple (LCM) of these numbers.

Calculation:

- We need to find LCM of 10, 12, 14, 16, and 18 = 5054
- ∴ The smallest natural number that can be divided by the first five 2-digit positive even numbers without leaving a remainder is 5040.

66. The mode of 5, 18, 6, 7, 6, 2, 3, 4, 24, 2, 7, 21, 2, 81 is:

A 6

B 2

C 81

D 7

Solution

Formula Used:

- The mode is the number that appears most frequently in a data set.
- Here, count of 2 is 3 times.
- The number that appears most frequently is 2.

67. Eight boxes, J, K, L, M, N, O, P and Q, are kept in a vertical pattern, one over the other but not necessarily in the same order). L is placed at the bottommost position. Q is at the third place from the top and N is just below J. Only two boxes are placed between Q and M. K is placed somewhere between M and N and O is just below Q. Which box is placed at the second position from the bottom?

A N

B P

C J

D M

Solution

- L is placed at the bottommost position.
- Q is at the third place from the top.

Sr.	Box
1	
2	
3	Q
4	
5	
6	
7	
8	L

- Only two boxes are placed between Q and M.
- O is just below Q.

Sr.	Box
1	
2	
3	Q
4	O
5	
6	M
7	
8	L

- K is placed somewhere between M and N.
- N is just below J.
- And, P will placed at the remaining position.

Sr.	Box
1	J
2	N
3	Q
4	O
5	K
6	M
7	P
8	L

- So, the box 'P' is placed at the second position from the bottom.

68. Ramadan is the _____ month of the Islamic calendar and the holy month of fasting.

A **ninth**

B tenth

C seventh

D eighth

Solution

- Ramadan is the ninth month of the Islamic lunar calendar.
- It is considered the holiest month, during which Muslims fast from dawn to sunset.
- The fasting during Ramadan is one of the Five Pillars of Islam, which are the foundation of Muslim life.
- The fast is meant to bring the faithful closer to God and to remind them of the suffering of those less fortunate.
- Ramadan concludes with the celebration of Eid al-Fitr, a festive day when the fast is broken.

69. If $x - \frac{1}{x} = 5$, then the value of $x^4 + \frac{1}{x^4}$ is:

A 727

B 627

C 927

D 827

Solution

- If $x^2 - \frac{1}{x^2} = k$ then $x^4 + \frac{1}{x^4} = k^2 + 2$
- Here,

  $x - \frac{1}{x} = 5$ then $x^2 + \frac{1}{x^2} = k^2 + 2 = 25 + 2 = 27$
- $\therefore x^4 + \frac{1}{x^4} = 27^2 + 2 = 729 - 2 = 727$

70. Six actors are sitting in a line facing the north. A is sitting at the first position, and G is sitting third to the right of A. H is sitting to the immediate right of G. F is sitting second to the right of A. L is sitting to the immediate right of A. S is sitting at the end of the line. Who is sitting to the immediate right of L?

A H

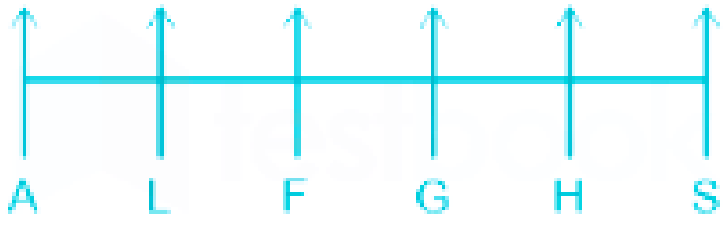
B G

C S

D **F**

Solution

- A is sitting at the first position, and G is sitting third to the right of A.
- H is sitting to the immediate right of G.
- F is sitting second to the right of A.
- L is sitting to the immediate right of A.
- S is sitting at the end of the line.



- So, 'F' is sitting to the immediate right of L.

71. Which of the following is NOT a constitutional body of the Government of India?

A Comptroller and Auditor General

B Election Commission

C **NITI Aayog**

D Union Public Service Commission

Solution

- NITI Aayog is not a constitutional body; it was formed via an executive resolution and serves as the policy think tank of the Government of India, providing both directional and policy inputs.
- Comptroller and Auditor General of India (CAG), Election Commission, and Union Public Service Commission (UPSC) are established by the Constitution of India, making them constitutional bodies.
- NITI Aayog was established in 2015, replacing the Planning Commission, an institution that was part of the Government of India for over six decades.
- The main role of the NITI Aayog is to foster cooperative federalism through structured support initiatives and mechanisms with the

States on a continuous basis, recognizing that strong States make a strong nation.

72. A wholesaler sells a tin of oil at Rs. 540 and bears a loss of 10%. Now, if he decides to sell another tin of oil with same cost at Rs. 696, his profit percentage in the sale of second tin will be equal to:

A 15%

B 12%

C **16%**

D 18%

Solution

- He sells a tin of oil at Rs. 540 and bears a loss of 10%.
- Initial Price = x × $\frac{90}{100}$ = 540

  x = $\frac{540 \times 100}{90}$

  = 600
- Now, he decides to sell another tin of oil with same cost at Rs. 696.
- Profit % = $\frac{696-600}{600} \times 100$

  = $\frac{96}{600} \times 100$

  = 16%

73. Which of the following goals does NASA hope to achieve by launching the HelioSwarm research mission?

A **Improving the understanding of the dynamics of the Sun**

B Improving the understanding of MARS

C Improving the understanding of Ionosphere

D Understanding the intense seasonal episodes of Pluto

Solution

- The HelioSwarm mission aims to provide unprecedented insights into the Sun's dynamics, specifically focusing on the turbulent nature of solar wind and its effects on space weather.
- It involves the deployment of a swarm of spacecraft to study the solar wind in three dimensions, which is crucial for understanding space weather patterns that can affect Earth and human technology.
- The mission seeks to improve predictions of space weather events, which can disrupt satellite communications, GPS systems, and power grids on Earth.
- Understanding the Sun's dynamics is also vital for the safety of astronauts in future manned missions to the Moon, Mars, and beyond, as solar radiation poses a significant risk.

74. How many molecules of hydrogen sulphide are required to balance the given chemical equation?

$$SO_2 + H_2S \rightarrow 3S + 2H_2O$$

A Four

B One

C **Two**

D Three

Solution

- The chemical equation given is $SO_2 + H_2S \rightarrow 3S + 2H_2O$.
- To balance the equation, we need equal numbers of atoms of each element on both sides.
- By adding two molecules of hydrogen sulphide (H_2S), we balance the sulphur (S) atoms: 1 from SO_2 and 2 from $2H_2S$ gives a total of 3 sulphur atoms on both sides.
- This also balances the hydrogen (H) atoms: 2 hydrogen atoms from each H_2S molecule make a total of 4, which matches the 4 hydrogen atoms in $2H_2O$.
- Therefore, two molecules of H_2S are required to balance the given chemical equation.

75. Suppose a human hair is 30.0 µm thick. If Reshmi uses a concave mirror of focal length 25 cm and obtains an image of the hair of 60 cm thickness, then the hair should be placed in front of the mirror at:

A 40 cm

B 60 cm

C 50 cm

D 25 cm

Solution

Concave Mirror:

- A concave mirror is a spherical mirror with a reflecting surface that curves inward.
- A concave mirror's focal length (f) is the distance between the mirror's surface and the focal point.
- Mirror formula: $\frac{1}{f} = \frac{1}{v} + \frac{1}{u}$, Where, f = Focal length, v = Image distance, u = Object distance.
- Magnification (M) is the ratio of the height of the image (h_i) to the height of the object (h_o).
- Magnification formula: M = $\frac{h_i}{h_o}$ = - $\frac{v}{u}$

Calculation:

- Given:

  Object height, (h_o) = 30 μm

  Image height, (h_i) = 60 cm

  Focal length, f = 25 cm

- Magnification, M = $\frac{60\times10^4\mu m}{30\mu m}$ = 2000

- We know, M = - $\frac{v}{u}$

  2000 = - $\frac{v}{u}$

  v = -2000 u

- Using mirror formula, $\frac{1}{f}=\frac{1}{v}+\frac{1}{u}$

  $\Rightarrow \frac{1}{25}=\frac{1}{-2000u}+\frac{1}{u}$
  $\Rightarrow \frac{1}{25}=\frac{1-2000}{2000u}$
  $\Rightarrow \frac{1}{25}=\frac{-1999}{2000u}$
  $\Rightarrow$ 2000 u = -1999 × 25
  $\Rightarrow$ u = - $\frac{1999\times25}{2000}$
  $\Rightarrow$ u = −24.9875 ≈ −25cm

- ∴ The hair should be placed in front of the mirror at 25 cm.

76. Which of the following groups in the Modern Periodic Table have NO metallic element?

A 17

B 14

C 16

D 15

Solution

- Group 17 elements are known as the halogens and are non-metals.
- These elements include fluorine, chlorine, bromine, iodine, and astatine.
- Halogens are highly reactive, especially with alkali metals and alkaline earth metals, forming a wide range of salts.
- They exist in various physical states: fluorine and chlorine are gases, bromine is a liquid, and iodine and astatine are solids at room temperature.
- The reactivity of halogens decreases down the group, with fluorine being the most reactive.

77. **As of August 2022, under which Mission has the Government of India subsumed the Child Protection Services Scheme of 2017?**

A Poshan

B Bachpan

C **Vatsalya**

D Indradhanush

Solution

- Child Protection Services Scheme was subsumed under Mission Vatsalya to provide a more consolidated and strengthened framework for child protection.
- Mission Vatsalya aims to offer a supportive environment for children in need of care and protection, children in conflict with law, and other vulnerable children.
- This mission focuses on delivering services through institutional and non-institutional care and ensuring the holistic development of children.

- It represents a significant step towards ensuring that children have access to social protection, health, nutrition, education, and legal support.

Option	Details
Poshan	Focuses on improving nutritional outcomes for children, pregnant women, and lactating mothers.
Bachpan	Not a government scheme as of the latest information available.
Indradhanush	Aims to immunize all children under the age of 2 years, as well as all pregnant women, against seven vaccine-preventable diseases.

78. **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:

1. All cashews are jaggery.

2. No food is jaggery.

3. Some walnuts are food.

Conclusions:

I. Some walnuts are cashews.

II. Some walnuts are jaggery.

III. No food is cashew.

A **Only conclusion III follows**

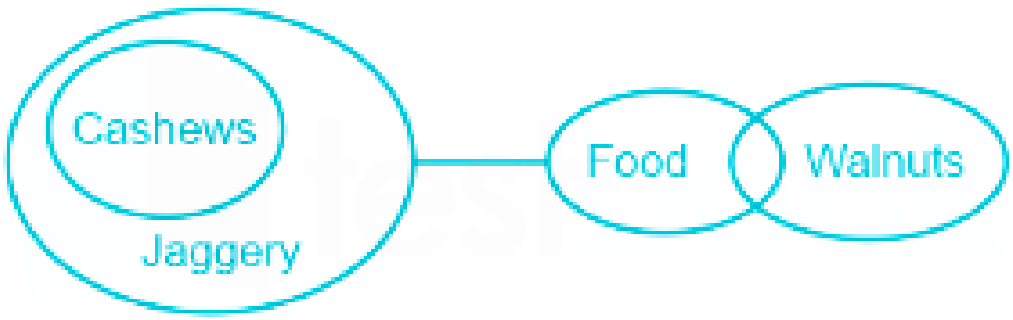
B All conclusions follow

C Only conclusions II and III follow

D Only conclusions I and II follow

Solution

- The least possible Venn diagram for the given statement is:



Conclusions:

- I. Some walnuts are cashews - False (Because, No definite relation given between walnuts and cashews, So, it can be possible only).
- II. Some walnuts are jaggery - False (Because, No definite relation given between walnuts and jaggery, So, it can be possible only).
- III. No food is cashew - True (Because, All the jaggery are jaggery and No food is jaggery, this implies No food is cashew).
- So, Only conclusion III follows.

79. The magnitude of force acting on the arms of an armature is maximum when the length of the arms is:

A at an angle of 45° to the magnetic field

B perpendicular to the magnetic field

C parallel to the magnetic field

D at an angle of 60° to the magnetic field

Solution

- The force on a charged particle moving in a magnetic field is at its maximum when the particle is moving at right angles to the direction of the magnetic field and zero when the particle is moving parallel to the field.
- The direction of the drift velocity of electrons in a conductor is along the length of the conductor.
- Thus, the magnitude of the force on a current-carrying conductor in a magnetic field varies with the angle between the direction of the length of the conductor and the direction of the magnetic field.
- Hence, The magnitude of force is at a maximum when the angle between the conductor and the magnetic field is 90 degrees, that is, when the direction of current in the conductor is perpendicular to the magnetic field.

80. A needle is placed at a distance 2.5f from the pole of a convex mirror of focal length f. The linear magnification is:

A \(\frac{2}{7}\)

B \(\frac{1}{7}\)

C \(\frac{3}{7}\)

D \(\frac{4}{7}\)

Solution

- Object distance, u = -2.5f
- Image distance, v = ?
- From mirror formula,

\(\frac{1}{f}\) = \(\frac{1}{u}\) + \(\frac{1}{v}\)

\(\frac{1}{f}\) - \(\frac{1}{u}\) = \(\frac{1}{v}\)

\(\frac{1}{f}\) + \(\frac{1}{2.5f}\) = \(\frac{1}{v}\)

\(\frac{1}{f}\) + \(\frac{2}{5f}\) = \(\frac{1}{v}\)

\(\frac{7f}{5f^2}\) = \(\frac{1}{v}\)

v = \(\frac{5}{7}f\)

m = - \(\frac{v}{u}\) = \(\frac{\frac{5}{7}}{\frac{5}{2}}\)

= \(\frac{5}{7}\) × \(\frac{2}{5}\)

= \(\frac{2}{7}\)

81. Two wires are of the same length and the same resistance, but the ratio of their cross-sectional areas is 1 : 8. The ratio of their resistivities will be:

A 1 : 8

B 8 : 3

C 8 : 1

D 3 : 8

Solution

- The resistance (R) of a wire is given by the formula R = ρ(\(\frac{L}{A}\)), where ρ is the resistivity, L is the length, and A is the cross-sectional area.
- Since, both wires have the same length and resistance, we can set up a ratio for their resistivities based on their cross-sectional areas.
- The ratio of their cross-sectional areas is 1 : 8, implying one wire has a cross-sectional area 8 times larger than the other.
- Given that resistance is inversely proportional to the area (A), the wire with the larger area will have a lower resistivity if all other factors are constant.
- However, since their resistances are the same and lengths are equal, the only way to balance the equation is if their resistivities are

inversely proportional to their areas, resulting in the ratio of resistivities being 1 : 8.

82. Ajay starts from his office and drives 3 km towards the east. He then takes a right tum, drives 4 km, tums left, and drives 5 km. He then takes a left turn and drives 3 km and stops at a shop. Which direction should he drive now in order to reach his office from that shop? (All turns are 90° turns only)

A North

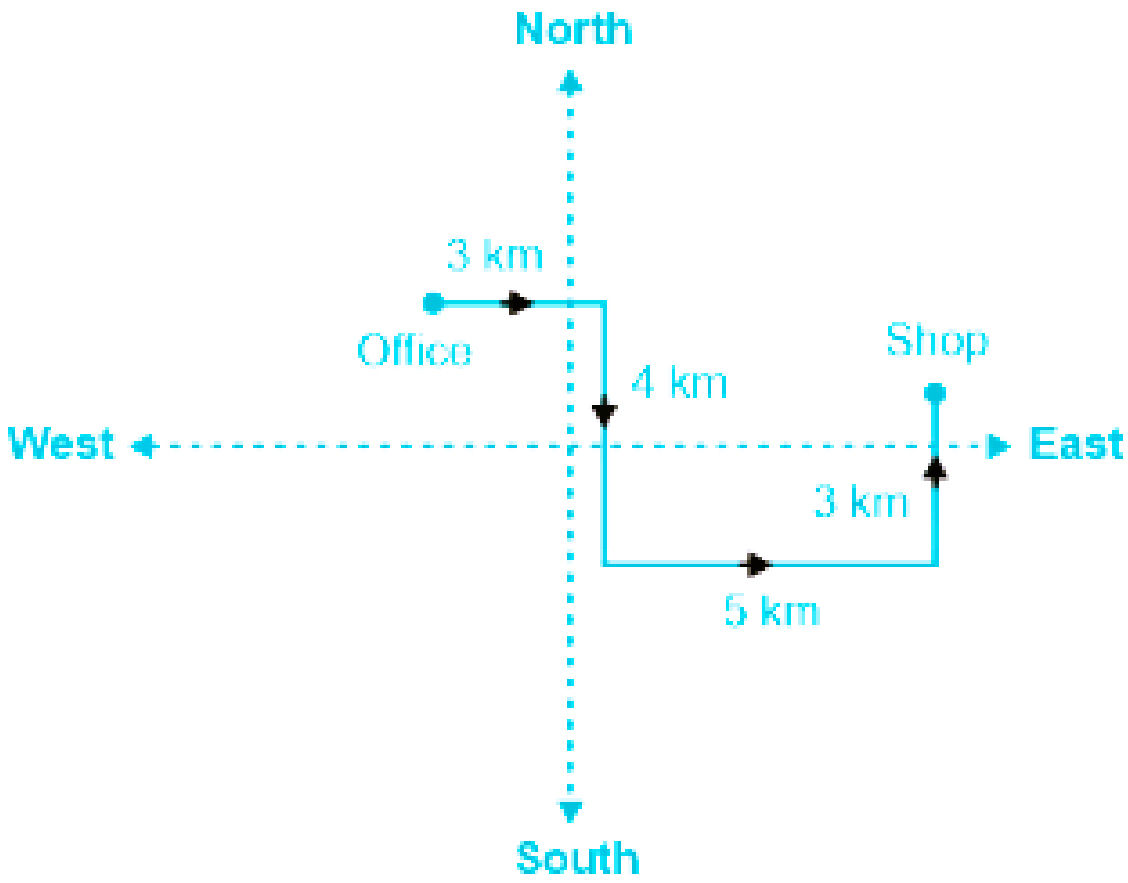
B South

C **North-West**

D South-East

Solution

- According to question,



- So, He should drive in 'North-West' direction to reach his office from that shop.

83. A commutator is used to change the direction of current in the coil of:

A AC generator only

B DC generator only

C DC Motor Only

D DC motor and DC generator both

Solution

- A commutator is an electrical switch that periodically reverses the current direction between the rotor and the external circuit in a motor or generator.
- It is used in DC motors to provide a direct current by switching the direction of the current in the motor coil as it rotates, ensuring smooth operation.
- In DC generators, commutators convert the AC (alternating current) induced in the generator's coil into a unidirectional current (DC).
- Commutators help in maintaining a constant direction of current in the external circuit, which is crucial for the functionality of DC machines.

84. **Read the given statement and the arguments carefully and select the appropriate answer from the given options.**

Statement:

India still needs gender equality programmes to make people aware about this.

Arguments:

I. People still believe boys are better than girls.

II. Gender discrimination has vanished from our society.

A **II weakens while I strengthens the statement.**

B Both I and II strengthen the statement.

C Both I and II weaken the statement.

D I weakens while II strengthens the statement.

Solution

Statement:

- India still needs gender equality programmes to make people aware about this.

Arguments:

- I. People still believe boys are better than girls - True (This argument supports the need for gender equality programmes as it highlights ongoing gender bias).
- II. Gender discrimination has vanished from our society - False (This argument contradicts the statement by claiming that there is no longer a need for awareness programs, as it suggests gender discrimination no longer exists).
- So, I strengthens the statement because it reflects the persistence of gender bias, necessitating awareness programs.
- II weakens the statement by incorrectly asserting that gender discrimination is no longer an issue.

85. Smaller particles scatter the light of \(\textit{_____}\) and \(\textit{_____}\) colour the most; on the other hand, larger particles scatter the light of \(\textit{_____}\) and \(\textit{_____}\) colour the most.

A red, orange; green, yellow

B violet, blue; red, orange

C violet, blue; green, yellow

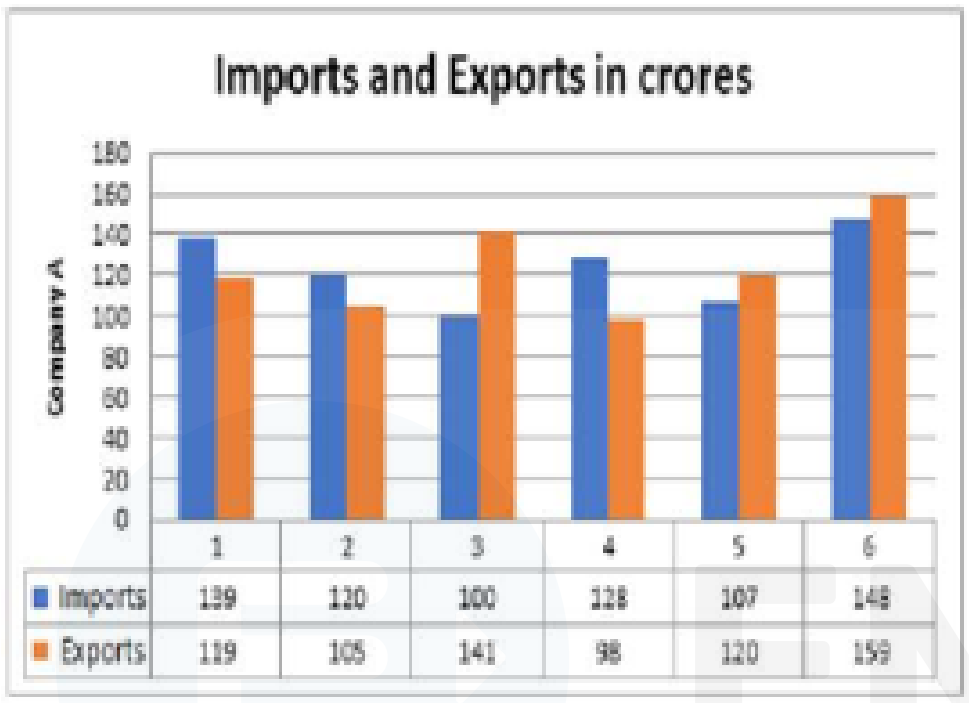
D red, orange; violet, blue

Solution

- Rayleigh scattering is a phenomenon that describes the scattering of light by particles much smaller than the wavelength of the light.
- Violet and blue light have shorter wavelengths and are scattered more by smaller particles in the atmosphere, which is why the sky appears blue during the day.
- Red and orange light, having longer wavelengths, are less scattered by smaller particles but are more affected by larger particles in the atmosphere, contributing to the red and orange hues of sunrises and sunsets.
- This scattering principle is crucial in understanding the color of the sky and various atmospheric phenomena.

86. **The given bar graph shows the exports and imports of Company A over a period of time. Study the bar graph and answer the question that follows.**

The numbers 1 to 6 in the graph represent the years from 2001 to 2006.



	1	2	3	4	5	6
Imports	139	120	100	128	107	148
Exports	119	105	141	98	120	159

For how many years are the exports at least 10% higher than the imports?

A 3

B **2**

C 1

D 4

Solution

Formula Used:

- Exports at least 10% higher than imports mean (Exports - Imports) ÷ Imports × 100 > 10%

Calculation:

- For 2001, Exports vs. Imports: (141 - 100) ÷ 100 × 100 = 41% [> 10%]
- For 2005, Exports vs. Imports: (120 - 107) ÷ 100 × 100 = 12.15% [> 10%]
- For 2006, Exports vs. Imports: (159 - 148) ÷ 100 × 100 = 7.43% [< 10%]
- ∴ For 2 years, the exports were at least 10% higher than the imports.

87. **A number is increased by 30% and then decreased by 40%. The net increase or decrease percentage is:**

A **22% decrease**

B 34% increase

C 44% decrease

D 32% increase

Solution

Formula Used:

- Net percentage change = a + b + (a × b) ÷ 100

Calculation:

- Let the original number be 100.
- After an increase of 30%, the new number = 100 + (30% of 100) = 130
- After a decrease of 40%, the new number = 130 - (40% of 130) = 130 - 52 = 78
- Net change = Final number - Original number = 78 - 100 = -22
- Net percentage change = \(\frac{-22}{100}\)× 100 = -22%

88. Answer the question asked on the basis of the letter, number and symbol series given below.

(Left) E 5 % H V 7 8 L M # @ A 6 3 F & S 4 Z (Right)

How many such letters are there in the above series, which are immediately preceded by a letter and immediately followed by a number?

A 2

B 3

C 0

D 1

Solution

- Given Series:

  (Left) E 5 % H V 7 8 L M # @ A 6 3 F & S 4 Z (Right)

- Letters immediately preceded by a letter and immediately followed by a number.

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

- So, there are 'One' pairs i.e. 'HV7'.

89. In India, the Integrated Wastelands Development Programme (IWDP) has been under implementation since \(\textit{_____}\).

A 2001-02

B 1994-95

C 1989-90

D 1991-92

Solution

- The Integrated Wastelands Development Programme (IWDP) was launched in 1989-90 in India.
- Its main objective is to reclaim wastelands in the country through various developmental measures including afforestation.
- IWDP aims to improve the socio-economic conditions of the people living in these areas.
- It employs a watershed management approach to optimize the use of natural resources like soil and water.
- The programme is implemented on a project basis, with projects typically spanning 4 to 5 years.

90. Who among the following was appointed the head coach of Indian Cricket Team in November 2021?

A VVS Laxman

B Sachin Tendulkar

C **Rahul Dravid**

D Anil Kumble

Solution

- Rahul Dravid was appointed as the head coach of the Indian Cricket Team in November 2021, succeeding Ravi Shastri.
- Dravid, also known as "The Wall", has been a pivotal figure in Indian cricket, having played for India with great distinction before transitioning to coaching roles.
- Before taking on the role of head coach for the senior team, Dravid was the head of the National Cricket Academy (NCA) in Bengaluru, India, where he played a significant role in grooming young talents.
- His appointment was well-received, given his vast experience and the respect he commands in the cricketing community.

91. Which of the following metals is the least reactive, as per the reactivity series of metals?

A **Lead**

B Zinc

C Magnesium

D Iron

Solution

- Reactivity Series: The reactivity series is a list of metals arranged in order of decreasing reactivity. It helps in determining which metal will displace another in a single displacement reaction.
- Lead's Position: Among the given options, lead is placed lower in the reactivity series, indicating it is less reactive compared to zinc, magnesium, and iron.
- Displacement Reactions: More reactive metals can displace less reactive metals from their compounds. Since, lead is less reactive, it is less likely to displace others in such reactions.
- Corrosion Resistance: Due to its lower reactivity, lead is more resistant to corrosion compared to the other metals listed.

Option	Details
Zinc	Zinc is more reactive than lead and is often used for galvanizing iron to protect it from rust.
Magnesium	Magnesium is very reactive, capable of displacing hydrogen from water, a property not shared with lead.
Iron	Iron is more reactive than lead but less so than magnesium and zinc, commonly used in construction due to its strength.

92. Refer to the following letter series and answer the question that follows.

(Left) E B Y T F R D C S W E R F V Y H N E C S R F C A R W (Right)

If every odd placed letter in the above series is dropped, which letter would appear at the seventh place from the left?

A V

B H

C F

D Y

Solution

- Given letter series:

  (Left) E B Y T F R D C S W E R F V Y H N E C S R F C A R W (Right)

- Now, If every odd placed letter in the above series is dropped then:

  (Left) B T R C W R V H E S F A W (Right)

- So, the seventh place from the left after dropped each odd placed letter in the above series is: 'V'.

93. When was Tamil declared a classical language of India?

A 2007

B 2006

C **2004**

D 2005

Solution

- Tamil was declared a classical language of India in the year 2004.
- This recognition was given by the Government of India, acknowledging Tamil's rich heritage and long history.
- The status of a classical language in India is awarded to languages that have a rich literary tradition and ancient heritage.
- Tamil is one of the oldest languages in the world, with a history that dates back over 2000 years.

94. What are the main products in the process of neutralisation reaction?

A \(CO_2\) and salt

B \(H_2O\) and salt

C \(O_2\) and salt

D \(N_2\) and salt

Solution

- Neutralisation is a chemical reaction in which an acid and a base react quantitatively with each other.
- In a neutralisation reaction, the hydrogen ions \((H^+)\) from the acid combine with the hydroxide ions \((OH^-)\) from the base to form water \((H_2O)\).
- The other product of a neutralisation reaction is a salt, which is formed from the cation of the base and the anion of the acid.
- This type of reaction is important in many processes, such as the manufacturing of various chemicals, wastewater treatment, and the neutralisation of stomach acid.
- Acids are substances that release hydrogen ions \((H^+)\) when dissolved in water.
- Bases are substances that release hydroxide ions \((OH^-)\) when dissolved in water.

- The pH scale is used to measure the acidity or alkalinity of a solution, with 7 being neutral, values below 7 acidic, and values above 7 alkaline.
- Salts are ionic compounds composed of cations (positively charged ions) and anions (negatively charged ions) that result from neutralisation reactions.

95. In March 2022, the Union Cabinet, chaired by Prime Minister Narendra Modi, has extended the Pradhan Mantri Garib Kalyan Anna Yojana till which period?

A **September 2022**

B September 2025

C September 2023

D September 2024

Solution

- The Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) is an initiative by the Government of India aimed at providing free food grains to the poor and needy.
- It was initially launched in March 2020 as part of the government's response to the economic impact of the COVID-19 pandemic.
- The scheme aims to ensure sufficient food for the most vulnerable sections of society by providing them with free ration.
- Under this scheme, eligible families are provided with additional food grains free of cost, over and above their regular entitlements under the National Food Security Act.
- The extension of the scheme is a part of the government's efforts to support the population facing hardship due to the pandemic and

economic challenges.

96. If three resistors of 3 Ω, 2 Ω and 6 Ω are connected in series combination with a 9 V battery, then the potential difference across the 6 Ω resistor will be:

A 2.4 V

B 4.9 V

C 9 V

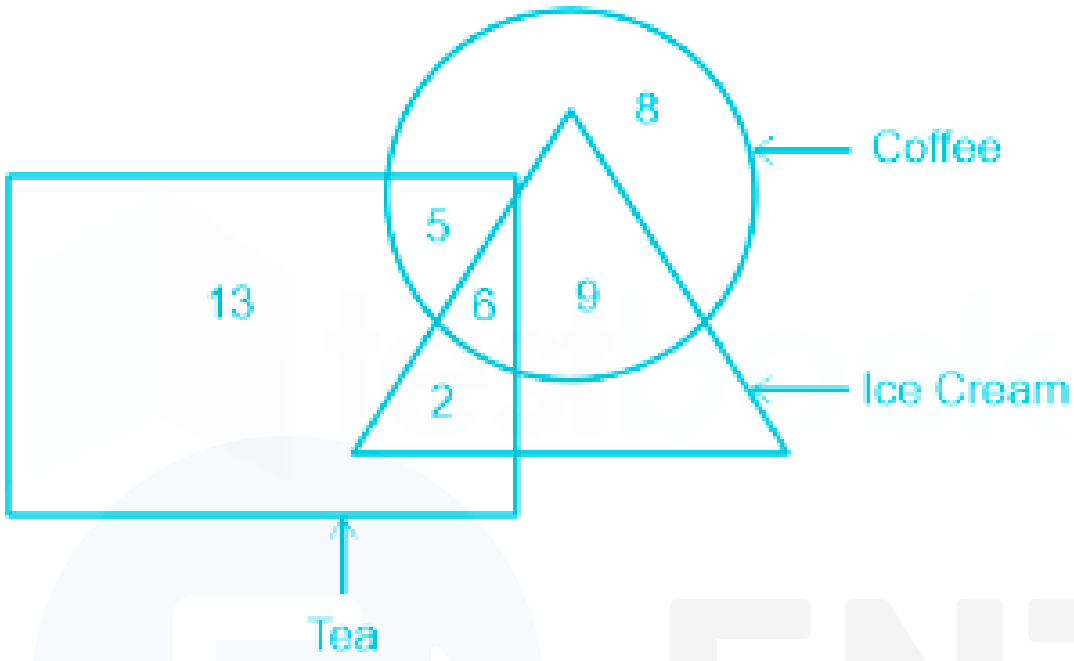
D 1.6 V

Solution

- The total resistance in a series circuit is the sum of all resistances. Therefore, for the given resistors of 3Ω, 2Ω, and 6Ω, the total resistance (Rtotal) is 3 + 2 + 6 = 11Ω.
- The total current (I) in the circuit can be calculated using Ohm's Law, V = IR, where V is the total voltage of the battery. For a 9V battery, I = V ÷ Rtotal = 9V ÷ 11Ω ≈ 0.818 A.
- To find the potential difference (V) across a specific resistor in a series circuit, use the formula V = IR, where I is the current through the resistor, and R is the resistance of the resistor.
- For the 6Ω resistor, the potential difference V = I × R = 0.818 A × 6Ω ≈ 4.9 V.

97. Study the given diagram carefully and answer the question that follows.

The numbers in different sections indicate the number of people who have coffee, tea, and ice cream.



How many people have all three i.e. Ice cream, Tea as well as Coffee?

A 2

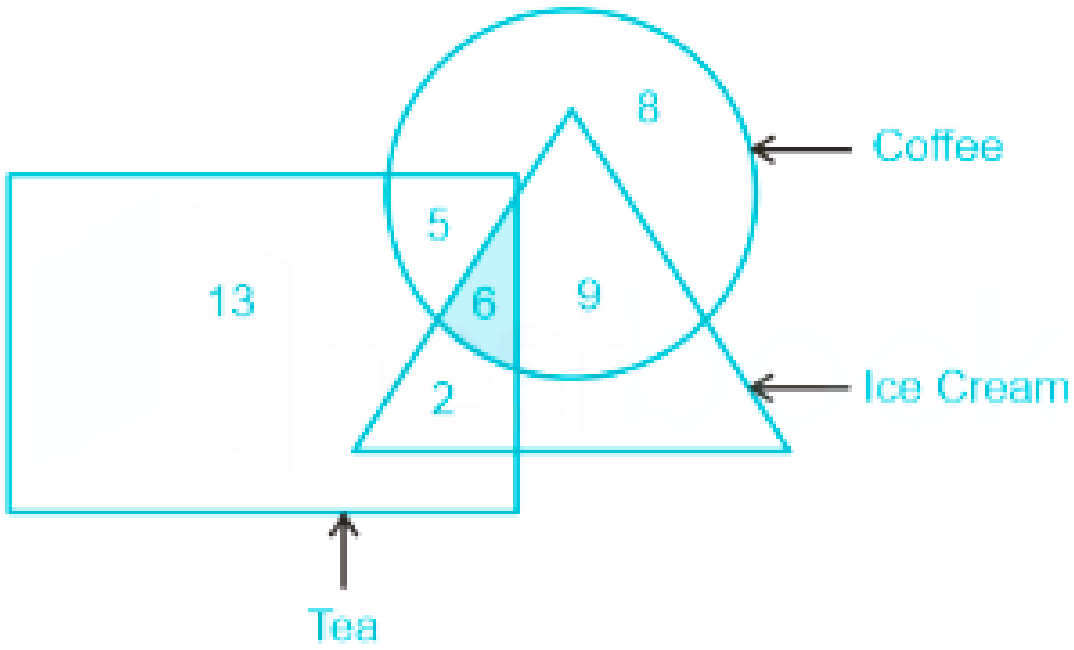
B 5

C **6**

D 9

Solution

- According to the given Venn diagram:



- The shaded area shows the "total number of people have all three i.e. Ice cream, Tea as well as Coffee".

- So, the total number of people have all three i.e. Ice cream, Tea as well as Coffee = 6.

98. At present, a man is 50 years old and his daughter is 22 years old. The man will be twice as old as his daughter after \ (\textit{_____}\) years.

A 6

B 9

C 18

D 5

Solution

Formula Used:

- Future age of man = Present age of man + x years
- Future age of daughter = Present age of daughter + x years

Calculation:

- Let after x years, the man will be twice as old as his daughter.

$\Rightarrow 50 + x = 2 \times (22 + x)$

$\Rightarrow 50 + x = 44 + 2x$

$\Rightarrow 50 - 44 = 2x - x$

$\Rightarrow 6 = x$

- $\therefore$ The man will be twice as old as his daughter after 6 years.

99. The first 'Home Rule League' was founded by \(\textit{_____}\).

A Bipin Chandra Pal

B Surendranath Tagore

C Chandra Shekhar Azad

D Bal Gangadhar Tilak

Solution

- Bal Gangadhar Tilak founded the first Home Rule League in April 1916, aiming at attaining self-governance for India within the British Empire.
- His league worked through constitutional methods to achieve its goals, focusing on areas like Maharashtra (excluding Bombay), Karnataka, Central Provinces, and Berar.
- Annie Besant launched another Home Rule League in September 1916, which covered the rest of India, working in parallel with Tilak's league.
- The Home Rule Movement significantly contributed to the nationalistic fervor in India, leading to a stronger demand for self-rule.

100. Consider two wires of the same material, but the ratio of their cross-sectional areas is 2 : 5 and the ratio of their lengths is 7 : 5. If the same amount of current is flowing through them when they are connected to two batteries with voltages V1 and V2, respectively, then V1 : V2 is:

A 7 : 5

B 2 : 7

C 2 : 5

D 7 : 2

Solution

- The resistance (R) of a wire is directly proportional to its length (L) and inversely proportional to its cross-sectional area (A), as given by the formula R = ρ(\(\frac{L}{A}\)), where ρ is the resistivity of the material.
- Given the ratio of their lengths is 7 : 5 and the ratio of their cross-sectional areas is 2 : 5, the resistance ratio can be calculated using the formula for resistance.
- Since, the same current flows through both wires when connected to two batteries, the voltage across each wire can be determined using Ohm's law, V = IR, where I is the current and R is the resistance.

- The ratio of voltages V1 : V2 will be directly proportional to the ratio of their resistances, which can be derived from their given dimensions.

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