

Answers

1. Answer: b

Explanation:

Algebra: Solving Absolute Value Expression

We are given the equation $a - 5 = b$ and asked to find the value of the expression $|a - b| + |b - a|$.

Step 1: Determine the Value of $a - b$

Rearrange the given equation $a - 5 = b$ to find the difference $a - b$:

$$a - b = 5$$

Step 2: Calculate $|a - b|$

Substitute the value of $a - b$ into the first absolute value term:

$$|a - b| = |5|$$

The absolute value of 5 is 5:

$$|a - b| = 5$$

Step 3: Calculate $|b - a|$

Recognize that $b - a$ is the negative of $a - b$:

$$b - a = -(a - b)$$

Substitute the value of $a - b$:

$$b - a = -(5) = -5$$

Calculate the absolute value:

$$|b - a| = |-5|$$

The absolute value of -5 is 5 :

$$|b - a| = 5$$

Step 4: Find the Total Value

Add the results from Step 2 and Step 3:

$$|a - b| + |b - a| = 5 + 5$$

$$|a - b| + |b - a| = 10$$

2. Answer: c

Explanation:

Calculate Car Speed: Step-by-Step Solution

This solution explains how to calculate the speed of a car given the distance covered and the time taken.

Given Information

- Distance (d) = 600 m
- Time (t) = 5 min

Convert Time Units

First, convert the time from minutes to seconds to match standard physics units.

- $t = 5\text{ min} \times 60 \frac{\text{s}}{\text{min}} = 300\text{ s}$

Calculate Speed in Meters per Second (m/s)

Use the formula for speed: Speed = Distance / Time.

- $s = \frac{d}{t}$
- $s = \frac{600 \text{ m}}{300 \text{ s}}$
- $s = 2 \text{ m/s}$

Convert Speed to Kilometers per Hour (km/h)

Convert the speed from m/s to km/h using the conversion factor $\frac{18}{5}$.

- $s_{\text{km/h}} = s_{\text{m/s}} \times \frac{18}{5}$
- $s_{\text{km/h}} = 2 \times \frac{18}{5}$
- $s_{\text{km/h}} = \frac{36}{5}$
- $s_{\text{km/h}} = 7.2 \text{ km/h}$

Therefore, the speed of the car is 7.2 km/h.

3. Answer: d

Explanation:

To find the value of $\sqrt{x^2 - 2xy + y^2}$, we can recognize this expression as a form of the perfect square trinomial, $(a - b)^2$, which is equal to $a^2 - 2ab + b^2$.

1. Identify the expression: Given $x^2 - 2xy + y^2$, it matches the pattern $(x - y)^2$.
2. Rewrite the expression using the formula: You can write the given expression as $(x - y)^2$.
3. Substitute the values of x and y : Here, $x = 25$ and $y = 13$. Therefore, we have $(25 - 13)^2$.
4. Calculate the value inside the square root: Simplify $25 - 13$ to get 12.
5. Apply the square root: The square root of $(12)^2$ is 12.

Thus, the value of $\sqrt{x^2 - 2xy + y^2}$ is 12.

The correct answer is: 12.

4. Answer: c

Explanation:

Kullu Valley Connection to Lahaul & Spiti

The question asks to identify the mountain pass that connects the Kullu valley with the Lahaul and Spiti valleys, both located within Himachal Pradesh, India.

Identifying the Connecting Pass

Understanding the geography of Himachal Pradesh is key to answering this question. Several mountain passes exist in the region, but only one specifically links the Kullu valley to the higher-altitude Lahaul and Spiti valleys.

- **Rohtang Pass:** This high mountain pass is situated on the Pir Panjal Range. It serves as the crucial gateway connecting the Kullu Valley (also known as the Beas River valley) with the Lahaul and Spiti Valleys. It is a vital link for transport and tourism.
- **Mayali Pass:** This is a high mountain pass in the Himachal Pradesh region, but it is not the primary connector between Kullu and Lahaul/Spiti valleys.
- **Nathula Pass:** Located in Sikkim, Nathula Pass is an important border post connecting India and China. It is geographically distant from Himachal Pradesh and does not connect the specified valleys.
- **Bara-Lacha Pass:** This pass connects the Lahaul valley to the Zaskar valley in Ladakh. While it connects to Lahaul, it does not directly connect Kullu to Lahaul/Spiti; Rohtang Pass serves that function.

Therefore, the Rohtang Pass is the definitive connection between the Kullu valley and the Lahaul and Spiti valleys.

5. Answer: c

Explanation:

Highest Value X Calculation

The problem requires finding the maximum possible digit value for X in the given equation $5Y6 + 6X7 + 3Z8 = 1511$. Here, X, Y, and Z represent single digits from 0 to 9.

Equation Structure Analysis

The equation represents the sum of three three-digit numbers. We can express these numbers in terms of their place values:

- $5Y6 = 5 \times 100 + Y \times 10 + 6$
- $6X7 = 6 \times 100 + X \times 10 + 7$
- $3Z8 = 3 \times 100 + Z \times 10 + 8$

Digits Relationship Derivation

Let's analyze the sum column by column to determine the relationship between the digits X, Y, and Z:

1. **Units Column:** The sum is $6 + 7 + 8 = 21$. The units digit of the result (1) is correct. A carry-over of 2 is generated for the tens column.
2. **Tens Column:** The sum in this column is $Y + X + Z + (\text{carry-over } 2)$. This sum must equal the tens digit of the result (1) plus 10 times the carry-over (C_h) to the hundreds column. Therefore, $Y + X + Z + 2 = 1 + 10 \times C_h$.
3. **Hundreds Column:** The sum in this column is $5 + 6 + 3 + C_h$. This sum must equal the hundreds digit of the result (5) plus 10 times the carry-over to the thousands column. Since the total sum is 1511, the carry-over to the thousands column is 1. So, $5 + 6 + 3 + C_h = 5 + 10 \times 1$. $14 + C_h = 15$. Solving for C_h , we get $C_h = 1$.

Substitute $C_h = 1$ back into the tens column equation:

$$Y + X + Z + 2 = 1 + 10 \times 1$$

$$X + Y + Z + 2 = 11$$

$$X + Y + Z = 9.$$

X Value Maximization

We found that $X + Y + Z = 9$. To maximize X , we need to minimize the values of Y and Z . Since Y and Z are digits, their minimum possible value is 0.

- Set $Y = 0$.
- Set $Z = 0$.

Substitute these minimum values into the sum equation:

$$X + 0 + 0 = 9$$

$$X = 9.$$

The highest possible value for X is 9. This is achieved when $Y=0$ and $Z=0$, resulting in the valid equation $506 + 697 + 308 = 1511$.

6. Answer: d

Explanation:

Calculating Square Side Length from Circumscribed Circle

The problem asks for the side length of a square when a circle with a radius of 8 cm circumscribes it. This means the square fits exactly inside the circle, with its corners touching the circle's edge.

Key Geometric Relationship

When a circle circumscribes a square, the **diameter** of the circle is equal to the **diagonal** of the square.

Calculations

1. **Find the circle's diameter:** The radius (r) is given as 8 cm. The diameter (d) is twice the radius.

Formula: $d = 2r$

Calculation: $d = 2 \times 8 \text{ cm} = 16 \text{ cm}$

2. **Relate diameter to square's diagonal:** As established, the diagonal (D) of the square equals the diameter of the circle.

Therefore, $D = 16 \text{ cm}$

3. **Calculate the square's side length:** Let the side length of the square be s . The relationship between the diagonal (D) and the side (s) of a square is given by the Pythagorean theorem applied to the square's right-angled triangle formed by two sides and the diagonal: $s^2 + s^2 = D^2$. This simplifies to $D = s\sqrt{2}$.

We need to find s . Rearranging the formula: $s = \frac{D}{\sqrt{2}}$

Substituting the value of D : $s = \frac{16 \text{ cm}}{\sqrt{2}}$

4. **Simplify the result:** Rationalize the denominator by multiplying the numerator and denominator by $\sqrt{2}$.

Calculation: $s = \frac{16}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{16\sqrt{2}}{2} \text{ cm}$

Final side length: $s = 8\sqrt{2} \text{ cm}$

The length of the side of the square is $8\sqrt{2} \text{ cm}$.

7. Answer: c

Explanation:

Maharatna Company Identification

The "Maharatna" status is the highest tier granted to Public Sector Undertakings (PSUs) in India. This status provides companies with significant autonomy in making investment decisions, aiming to enhance their competitiveness and operational efficiency.

Evaluating PSU Options

- **Bharat Petroleum Corporation Limited (BPCL):** This company is designated as a 'Maharatna' PSU, signifying its large scale of operations and financial strength.
- **Hindustan Aeronautics Limited (HAL):** HAL holds the 'Navratna' status, which is a significant but lower tier compared to Maharatna.
- **Oil India Limited (OIL):** OIL is also classified as a 'Maharatna' company, meeting the criteria for this top-level designation.
- **Bharat Electronics Limited (BEL):** BEL is classified as a 'Navratna' company.

Confirming Maharatna Status

Based on the classifications, both BPCL and OIL are Maharatna companies. However, aligning with the structure of the question expecting a single answer choice, and given the options, **Bharat Petroleum Corporation Limited (BPCL)** is confirmed as a Maharatna company.

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8. Answer: d

Explanation:

Finding the Principal Sum using CI-SI Difference

The problem asks us to find the principal sum (P) when the difference between compound interest (CI) and simple interest (SI) for 2 years at a rate (R) of 5% per annum is ₹16.32.

Key Formula for 2 Years

For a time period of 2 years, the difference between CI and SI can be calculated using the formula:

$$\text{Difference} = P \times \left(\frac{R}{100}\right)^2$$

Where:

- P = Principal Sum
- R = Annual Interest Rate

Applying the Formula

We are given:

- Difference = ₹16.32
- Rate (R) = 5%

Substitute these values into the formula:

$$16.32 = P \times \left(\frac{5}{100}\right)^2$$

Calculation Steps

1. Simplify the rate term: $\left(\frac{5}{100}\right)^2 = \left(\frac{1}{20}\right)^2 = \frac{1}{400}$
2. Rewrite the equation: $16.32 = P \times \frac{1}{400}$
3. Solve for P : $P = 16.32 \times 400$
4. Calculate the final value: $P = 6528$

Conclusion

The principal sum is ₹6,528.

9. Answer: d

Explanation:

The question asks to identify the missing term in the given series: A9B, B125C, C49D, D729E, _____. We need to find the pattern governing the letters and numbers.

Analyzing the Series Pattern

Let's break down the series into its components: the first letter, the number, and the second letter.

First Letter Pattern

- The first letters follow the sequence: A, B, C, D.
- This is a simple alphabetical progression.
- The next letter in the sequence is E.

Second Letter Pattern

- The second letters follow the sequence: B, C, D, E.
- This is also a simple alphabetical progression, starting from B.
- The next letter in the sequence is F.

Number Pattern

- The numbers in the series are 9, 125, 49, 729.
- Let's analyze these numbers:
 - $9 = 3^2$
 - $125 = 5^3$
 - $49 = 7^2$
 - $729 = 9^3$
- The bases of these powers are 3, 5, 7, 9. This sequence consists of consecutive odd numbers starting from 3. The next odd number is 11.
- The exponents alternate between 2 and 3: 2, 3, 2, 3. The next exponent should be 2.
- Therefore, the next number in the sequence is calculated using the next base (11) and the next exponent (2): 11^2 .
- Calculation: $11^2 = 11 \times 11 = 121$.

Determining the Missing Term

Combining the patterns for the first letter, number, and second letter:

- First Letter: E
- Number: 121
- Second Letter: F

The missing term is E121F.

Comparing with Options

Let's compare our result with the given options:

1. G221H
2. F122G
3. E36F
4. E121F

The calculated term E121F matches Option 4.

10. Answer: a

Explanation:

The problem requires calculating the time taken to cover a distance at a new speed, given the initial speed and time taken to cover the same distance.

Distance Calculation

First, calculate the total distance covered. The formula for distance is:

$$\text{Distance} = \text{Speed} \times \text{Time}$$

Given:

- Walking Speed = 3 km/h
- Time spent walking = 8 hours

So, the distance is:

$$\text{Distance} = 3 \text{ km/h} \times 8 \text{ hours} = 24 \text{ km}$$

Running Time Calculation

Next, calculate the time the man will take to cover the same distance (24 km) while running at the new speed. The formula for time is:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Given:

- Distance = 24 km
- Running Speed = 16 km/h

Therefore, the time taken to cover the distance while running is:

$$\text{Time} = \frac{24 \text{ km}}{16 \text{ km/h}} = 1.5 \text{ hours}$$

The man will take 1.5 hours to cover the same distance if he runs at 16 km/h.

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11. Answer: b

Explanation:

Durand Cup Football Association

The Durand Cup is one of the oldest and most prestigious football competitions in the world.

It is an annual domestic association football (soccer) competition contested by various Indian club teams.

Therefore, the Durand Cup is primarily associated with **Football**.

12. Answer: a

Explanation:

Mahabharata Original Name Identified

The question asks to identify the original name of the Mahabharata epic.

Original Name Explained

The Mahabharata, a cornerstone of Indian literature and philosophy, was initially known as **Jaya Samhita**.

This name signifies its early form as a compilation ('Samhita') focusing on 'victory' ('Jaya').

Option Analysis

- **Jaya Samhita:** Correctly identifies the original name.
- **Bhrigu Samhita, Shiva Samhita, Sushruta Samhita:** These are names of other distinct texts and are incorrect options for the Mahabharata's original name.

Therefore, Jaya Samhita is the original name of the Mahabharata.

13. Answer: c

Explanation:

Battle of Haldighati Key Date

The Battle of Haldighati was a notable conflict in Indian history.

This intense battle occurred between the Mughal Empire's forces and the army of Maharana Pratap of Mewar.

The specific year this significant engagement took place was **1576**.

Key details of the battle:

- **Combatants:** Mughal Empire (led by Raja Man Singh I) vs. Mewar Kingdom (led by Maharana Pratap).
- **Location:** Haldighati pass in the Aravalli Range.
- **Year:** 1576 CE.

14. Answer: d

Explanation:

Compound Interest Division Calculation

The problem requires dividing ₹20,609 between A and B such that their amounts are equal after different time periods with compound interest.

Define Variables and Conditions

- Let the principal amounts given to A and B be P_A and P_B respectively.
- Total amount: $P_A + P_B = 20,609$.
- Interest rate (r) = 3% per annum = 0.03.
- Time for A (t_A) = 7 years.
- Time for B (t_B) = 9 years.
- Compounding is yearly.
- Condition: Amount of A after 7 years = Amount of B after 9 years.

Apply Compound Interest Formula

The formula for the amount (A) with compound interest is $A = P(1 + r)^t$, where P is the principal, r is the rate, and t is the time.

- Amount for A: $A_A = P_A(1 + 0.03)^7 = P_A(1.03)^7$.
- Amount for B: $A_B = P_B(1 + 0.03)^9 = P_B(1.03)^9$.

Set Amounts Equal and Solve for Principals

Given $A_A = A_B$:

$$P_A(1.03)^7 = P_B(1.03)^9$$

Divide both sides by $(1.03)^7$:

$$P_A = P_B \frac{(1.03)^9}{(1.03)^7}$$

$$P_A = P_B(1.03)^{9-7}$$

$$P_A = P_B(1.03)^2$$

Calculate $(1.03)^2$:

$$(1.03)^2 = 1.0609$$

$$\text{So, } P_A = 1.0609 \times P_B.$$

Calculate the Principal Amounts

Substitute P_A in the total amount equation:

$$(1.0609 \times P_B) + P_B = 20,609$$

Factor out P_B :

$$P_B(1.0609 + 1) = 20,609$$

$$P_B(2.0609) = 20,609$$

Solve for P_B :

$$P_B = \frac{20,609}{2.0609} = 10,000$$

Now find P_A :

$$P_A = 20,609 - P_B = 20,609 - 10,000 = 10,609$$

Final Distribution

The amounts are:

- A receives ₹10,609.
- B receives ₹10,000.

15. Answer: a

Explanation:

President's Ordinance Power Article

The Indian President holds the power to legislate via ordinances when the Parliament is not in session. This power ensures governance continuity when immediate legislative action is required.

Constitutional Provision for Ordinances

This specific executive power of the President is explicitly mentioned in the Constitution of India.

- **Article 123** of the Indian Constitution empowers the President to promulgate ordinances during the recess of either House of Parliament. These ordinances have the same force and effect as an Act of Parliament but are temporary.

Relevance of Other Articles

- Article 63 pertains to the Vice-President of India.
- Article 352 relates to the Proclamation of Emergency.
- Article 52 establishes the President of India.

Therefore, the power to promulgate ordinances during parliamentary recess is enshrined in Article 123.

16. Answer: c

Explanation:

G7 Environment Ministers 2019 Meeting Location

In 2019, the environment ministers from the Group of Seven (G7) nations convened to discuss critical environmental issues, specifically addressing a concerning report on the planet's condition.

Key Discussion and Location

- The G7 environment ministers gathered in **France** in 2019.
- The primary agenda was to deliberate on the alarming findings presented in a report detailing the state of the planet.
- This meeting highlighted the collective concern of major industrialized nations regarding pressing environmental challenges.

Therefore, the country where the G7 environment ministers met in 2019 was France.

17. Answer: b

Explanation:

Decoding the Coding Pattern

The question presents a coding challenge where a word is represented by a number. We need to figure out the pattern used to code 'SCHOOL' as 72 and apply it to 'FLOWER'.

Analyzing 'SCHOOL' to 72

Let's find the sum of the alphabetical positions of the letters in 'SCHOOL':

- S = 19
- C = 3
- H = 8
- O = 15
- O = 15
- L = 12

Total Sum = $19 + 3 + 8 + 15 + 15 + 12 = 72$.

The coding pattern is the sum of the positional values of the letters in the alphabet.

Applying Pattern to 'FLOWER'

Now, let's apply the same pattern to the word 'FLOWER':

- F = 6
- L = 12
- O = 15
- W = 23
- E = 5
- R = 18

Total Sum for FLOWER = $6 + 12 + 15 + 23 + 5 + 18 = 79$.

Conclusion

Following the established pattern, 'FLOWER' is coded as the number 79.

18. Answer: b

Explanation:

Identifying the Membrane-Bound Sac with Digestive Enzymes

The question asks to identify the cellular component that is a membrane-bound sac containing digestive enzymes.

- **Lysosomes** are known as the 'digestive system' of the cell. They are spherical, membrane-enclosed organelles containing hydrolytic enzymes that break down waste materials and cellular debris.
- **Mitochondria** are primarily involved in cellular respiration and ATP production.
- The **Golgi apparatus** (or Golgi complex) modifies, sorts, and packages proteins and lipids for secretion or delivery to other organelles.
- **Vacuoles** are membrane-bound sacs with varied functions, including storage, waste disposal, protection, and growth, but they are not primarily defined by containing digestive enzymes in the same way lysosomes are.

Therefore, lysosomes are the correct answer as they are specifically characterized by being membrane-bound sacs filled with digestive enzymes.

Correct Option: 2. Lysosomes

19. Answer: c

Explanation:

Identifying Computer Input Devices

Input devices allow users to send data or commands to a computer. A mouse is a common example. We need to identify which of the given options is also an input device.

Option Analysis

- **Speakers:** Output devices. They produce sound from the computer.

- **Printer:** Output device. It produces a hard copy of digital documents.
- **Scanner:** Input device. It converts physical documents or images into digital data that the computer can process.
- **Monitor:** Output device. It displays visual information from the computer.

Conclusion

Based on the analysis, the **Scanner** is the only device listed that functions as an input device, similar to the mouse.

20. Answer: d

Explanation:

Hampi Ruins Engineer Identified

The question asks for the engineer credited with revealing the archaeological ruins located in Hampi.

Colonel Colin Mackenzie was the engineer and surveyor who brought the significant ruins at Hampi to light.

His work involved surveying and documenting historical sites, including those in Hampi, during his tenure as the first Surveyor General of India.

21. Answer: b

Explanation:

Railway Zones: Identifying the Odd One Out

The question asks to identify the "odd one out" from the given railway zone names. This requires knowledge of the actual Zonal Railways operating in India.

Analyzing Railway Zone Names

- **Eastern Railway:** This is a recognized Zonal Railway.
- **Western Railway:** This is also a recognized Zonal Railway.
- **East Coast Railway:** This is a recognized Zonal Railway.
- **West Coast Railway:** This name does not correspond to any official Zonal Railway in India. While there are railways in the western and coastal regions (like West Central Railway, South Western Railway, Konkan Railway), "West Coast Railway" itself is not a designated zone.

Conclusion

Based on the official list of Indian Railway Zones, "West Coast Railway" is the only name that does not represent an existing zone. Therefore, it is the odd one out.

22. Answer: c

Explanation:

To determine the 64th day from today, if today is a Tuesday, we can follow these steps:

1. We know there are 7 days in a week: Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, and Saturday.
2. The current day is Tuesday. We need to find out what the 64th day will be.
3. To do this, divide 64 by 7 to find out how many full weeks and extra days there are:

$64 \div 7 = 9 \text{ weeks and } 1 \text{ day remainder.}$

4. This means that 64 days from today is equivalent to 9 full weeks plus 1 extra day.
5. If today is Tuesday, then after 9 full weeks, it will still be Tuesday.
6. Adding the extra one day to Tuesday, the day will be Wednesday.

Therefore, the 64th day from today will be **Wednesday**.

23. Answer: b

Explanation:

Kolkata Metro Commercial Services Start Date

The Kolkata Metro rail commenced its commercial services on **24 October 1984**. This marked a significant milestone in the development of urban mass transit systems in India.

Key Fact Verification

- The question asks for the year Kolkata Metro rail opened for commercial services.
- Based on historical records, the service began operations in 1984.
- Therefore, option 2 (1984) is the correct answer.

24. Answer: d

Explanation:

Cobalt and Vitamin B12 Identification

Cobalt is a trace mineral essential for human health. It plays a unique role in the structure of a specific vitamin.

The vitamin that uniquely contains cobalt as a central component of its molecular structure is Vitamin B12, also known as Cobalamin.

- Cobalt is not typically found in Vitamins B1, B5, or B3.
- Vitamin B12's complex structure features a cobalt ion at its core.

Therefore, Cobalt is present in Vitamin B12.

Correct Answer: Vitamin B12

25. Answer: d

Explanation:

Simplifying the Square Root of $58\frac{7}{9}$

To find the value of $\sqrt{58\frac{7}{9}}$, we first convert the mixed number $58\frac{7}{9}$ into an improper fraction.

- Multiply the whole number part (58) by the denominator (9): $58 \times 9 = 522$.
- Add the numerator (7) to the result: $522 + 7 = 529$.
- The improper fraction is $\frac{529}{9}$.

Calculating the Square Root

Now, we need to calculate the square root of the improper fraction:

$$\sqrt{58\frac{7}{9}} = \sqrt{\frac{529}{9}}$$

This can be split into the square root of the numerator and the square root of the denominator:

$$\sqrt{\frac{529}{9}} = \frac{\sqrt{529}}{\sqrt{9}}$$

- Calculate the square root of the numerator: $\sqrt{529} = 23$ (since $23 \times 23 = 529$).
- Calculate the square root of the denominator: $\sqrt{9} = 3$.

So, the value is:

$$\frac{23}{3}$$

Converting to a Mixed Number

Finally, convert the improper fraction $\frac{23}{3}$ back to a mixed number.

- Divide 23 by 3: $23 \div 3 = 7$ with a remainder of 2.
- The mixed number is $7\frac{2}{3}$.

Therefore, $\sqrt{58\frac{7}{9}} = 7\frac{2}{3}$.

26. Answer: c

Explanation:

To solve this problem, we need to determine how many days A worked before leaving. Let's break the problem down step-by-step:

1. First, determine the work rate of A and B. If A can complete the work in 56 days, A's work rate is $\frac{1}{56}$ of the work per day. Similarly, if B can complete the work in 70 days, B's work rate is $\frac{1}{70}$ of the work per day.
2. Let A and B start the work together and let A leave after 'x' days. During this time, A and B together would have completed:

$x \left(\frac{1}{56} + \frac{1}{70} \right)$ of the work.

3. After A leaves, B finishes the remaining work in 34 days. Therefore, the amount of work B completes is:

$$34 \times \frac{1}{70}$$

Since the total work is 1 (or 100%), the complete equation for the work done is:

$$x \left(\frac{1}{56} + \frac{1}{70} \right) + 34 \times \frac{1}{70} = 1$$

4. Simplify and solve the equation:

The sum of A and B's work rates is:

$$\frac{1}{56} + \frac{1}{70} = \frac{70+56}{3920} = \frac{126}{3920} = \frac{9}{280}$$

Therefore, the equation becomes:

$$x \times \frac{9}{280} + \frac{34}{70} = 1$$

Convert $\frac{34}{70}$ to simplify:

$$\frac{34}{70} = \frac{17}{35}$$

Thus, the equation transforms to:

$$x \times \frac{9}{280} + \frac{17}{35} = 1$$

Multiply through by 280 to eliminate fractions:

$$9x + \frac{17 \times 280}{35} = 280$$

Calculate $\frac{17 \times 280}{35}$:

$$\frac{4760}{35} = 136$$

We get:

$$9x + 136 = 280$$

Solving for x gives:

$$9x = 280 - 136 = 144 \quad x = \frac{144}{9} = 16$$

5. Therefore, A worked for 16 days before leaving the task for B to complete.

Conclusion: A left the work after 16 days.

27. Answer: b

Explanation:

Ratio Problem Setup

We are given the ratio of two variables, p and q:

- $p : q = 9 : 2$

This relationship can be expressed using a constant of proportionality, say k .
Therefore:

- $p = 9k$
- $q = 2k$

Expression Simplification

The task is to find the value of the ratio $(4p + 7q) : (4p - 7q)$. We substitute the expressions for p and q in terms of k into this ratio:

- $(4p + 7q) = 4(9k) + 7(2k)$
- $(4p - 7q) = 4(9k) - 7(2k)$

Perform the multiplication:

- $4(9k) = 36k$
- $7(2k) = 14k$

Now substitute these results back:

- $(4p + 7q) = 36k + 14k = 50k$
- $(4p - 7q) = 36k - 14k = 22k$

Final Ratio Calculation

The ratio $(4p + 7q) : (4p - 7q)$ is therefore:

- $50k : 22k$

Assuming $k \neq 0$, we can cancel k from both sides of the ratio:

- $50 : 22$

To simplify this ratio, we divide both numbers by their greatest common divisor, which is 2:

- $50 \div 2 = 25$

- $22 \div 2 = 11$

The simplified ratio is:

- $25 : 11$

28. Answer: a

Explanation:

Ozone Layer Measurement Unit

The thickness of the ozone layer is quantified using a specific unit of measurement.

Understanding the Dobson Unit

The standard unit for measuring ozone layer thickness is the **Dobson unit** (DU). This unit represents the mass of ozone in a vertical column of atmosphere spanning from the ground to the edge of space.

- One Dobson unit corresponds to a layer of pure ozone at standard temperature and pressure that is 0.01 millimeters thick.
- For example, a typical ozone layer thickness of 300 DU is equivalent to a layer of pure ozone that is 3 millimeters thick.

Incorrect Measurement Units

The other options provided are used for different types of measurements:

- **Decibels (dB):** Used to measure sound intensity or signal power.
- **Del unit:** Not a standard scientific unit for this purpose; 'del' typically refers to a vector differential operator in vector calculus.
- **Sievert unit (Sv):** Used to measure the equivalent dose of ionizing radiation.

Therefore, the correct unit for ozone layer thickness is the Dobson unit.

29. Answer: c

Explanation:

Tulughama: Babur's Military Strategy

The term 'Tulughama' refers to a specific military tactic.

It was a flanking maneuver, inspired by Ottoman tactics, famously employed by Babur, the founder of the Mughal Empire.

Key aspects of Tulughama:

- It involved dividing the army into specialized units.
- These units would execute flanking movements to encircle the enemy.
- Often combined with the use of cannons and matchlocks, it proved highly effective against larger, less mobile Indian armies.
- Babur utilized this strategy effectively, most notably in the First Battle of Panipat (1526) and the Battle of Khanwa (1527).

Therefore, Tulughama was a significant military strategy used by Babur.

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30. Answer: c

Explanation:

Logical Reasoning: Analyzing Statements and Conclusions

This problem requires us to determine which conclusions logically follow from the given statements using principles of deductive reasoning, specifically syllogisms.

Analyzing the Statements

- **Statement 1:** All goats are cats.
This can be represented as: If something is a goat, then it is a cat. ($Goat \implies Cat$)
- **Statement 2:** All cats are rats.
This can be represented as: If something is a cat, then it is a rat. ($Cat \implies Rat$)

Evaluating the Conclusions

Conclusion 1: Some rats are cats

- Statement 2 states that *All cats are rats* ($Cat \implies Rat$).
- This means the set of all cats is entirely contained within the set of all rats.
- If this is true, and assuming cats exist, then it must be true that at least some members of the set 'rats' are also members of the set 'cats'.
- Therefore, Conclusion 1 logically follows from Statement 2.

Conclusion 2: All rats are goats

- From Statement 1 ($Goat \implies Cat$) and Statement 2 ($Cat \implies Rat$), we can deduce through transitivity that *All goats are rats* ($Goat \implies Rat$).
- Conclusion 2 claims the reverse: *All rats are goats* ($Rat \implies Goat$).
- The fact that all goats are rats does not logically imply that all rats must be goats. There could be rats that are not goats.
- Therefore, Conclusion 2 does not logically follow.

Final Deduction

Based on the analysis, only Conclusion 1 is logically supported by the given statements.

31. Answer: b

Explanation:

Dholavira Location Identified

Dholavira is a significant archaeological site associated with the Indus Valley Civilization.

This ancient city is situated in the state of **Gujarat**, India.

32. Answer: d

Explanation:

Analogy Reasoning: Dates and Events

This question is based on an analogy. We need to find the relationship between the first pair of terms and apply it to the second pair.

First Pair Analysis: 15 August : Freedom

The first term, **15 August**, is a significant date in Indian history. It marks India's Independence Day, the day the country gained freedom from British rule. Therefore, the relationship is **Date : Primary Event/Significance**.

Second Pair Analysis: 26 January : ?

The third term is **26 January**. We need to identify the primary event or significance associated with this date in India, similar to how 15 August relates to Freedom.

- **26 January** is celebrated as India's Republic Day.
- This date commemorates the day the Constitution of India came into effect in 1950.
- The adoption and implementation of the Constitution established India as a sovereign, democratic republic.

Connecting the Relationship

Applying the relationship **Date : Primary Event/Significance:**

- 15 August signifies Freedom.
- 26 January signifies the adoption and enforcement of the **Constitution**, which defined India as a republic.

Comparing this with the options:

- Secularism, Parliament, and Democracy are all important aspects of India, but the Constitution is the foundational document that was officially adopted and enacted on 26 January, making it the most direct and primary significance.

Therefore, the term that completes the analogy is **Constitution**.

33. Answer: d

Explanation:

Second Schedule of Indian Constitution: Official Salaries

The Second Schedule of the Indian Constitution specifically addresses the provisions concerning the **emoluments, allowances, and privileges** of certain constitutional officeholders.

It details the financial entitlements for individuals holding high constitutional offices. This includes:

- **Salary of the President** of India.
- **Salary of the Governors** of States.
- **Salary of the Speaker and the Deputy Speaker** of the Lok Sabha and Legislative Assemblies.
- **Salary of the Chairman and the Deputy Chairman** of the Rajya Sabha and Legislative Councils.
- **Salary of the Judges** of the Supreme Court.
- **Salary of the Judges** of the High Courts.
- **Salary of the Comptroller and Auditor-General** of India.

Therefore, the Second Schedule directly pertains to the salary structures of these high-ranking officials.

34. Answer: c

Explanation:

Largest Uranium Producer Identified

In 2019, Kazakhstan was recognized as the world's leading producer of Uranium.

Global Uranium Production Ranking 2019

Kazakhstan held the top position in global Uranium production for the year 2019. This places it as the most significant source of this critical element for nuclear energy and other applications during that period.

35. Answer: c

Explanation:

Ramsar Convention Purpose

The Ramsar Convention is an international treaty focused on the conservation and wise use of wetlands.

Understanding the Convention's Aim

The primary objective of the Ramsar Convention is to ensure the conservation of specific types of ecosystems. Let's examine the options:

- **Conservation of soil fertility:** While related to land management, this is not the specific focus of the Ramsar Convention.
- **Conservation of tropical forests:** Forest conservation is addressed by other international agreements, not primarily the Ramsar Convention.
- **Conservation of wetlands:** This aligns directly with the Ramsar Convention's core mission. The convention provides a framework for national action and international cooperation for the preservation and promotion of the sustainable utilization of wetland habitats.
- **Control of ozone layer depletion:** This issue is addressed by the Montreal Protocol and related agreements.

Therefore, the Ramsar Convention is specifically dedicated to the **conservation of wetlands**.

36. Answer: a

Explanation:

Understanding the Relationship

Let the cost price (CP) of one item be C and the selling price (SP) of one item be S .

The problem states that the selling price of 150 items is equal to the cost price of 125 items.

This can be written as:

$$150 \times S = 125 \times C$$

Calculating the SP/CP Ratio

To find the relationship between the selling price and cost price, we rearrange the equation:

$$\frac{S}{C} = \frac{125}{150}$$

Simplifying the fraction:

$$\frac{S}{C} = \frac{5 \times 25}{6 \times 25} = \frac{5}{6}$$

This means that for every 6 units of cost price, the selling price is 5 units.

Determining and Calculating Loss

Since the selling price ($S = \frac{5}{6}C$) is less than the cost price (C), there is a loss.

The loss amount per item can be calculated as:

$$Loss = C - S$$

Substituting $S = \frac{5}{6}C$:

$$Loss = C - \frac{5}{6}C = \frac{1}{6}C$$

Calculating Percentage Loss

The percentage loss is calculated using the formula:

$$Percentage\ Loss = \left(\frac{Loss}{CP} \right) \times 100\%$$

Substituting the values:

$$Percentage\ Loss = \left(\frac{\frac{1}{6}C}{C} \right) \times 100\%$$

$$Percentage\ Loss = \frac{1}{6} \times 100\%$$

$$Percentage\ Loss = \frac{100}{6}\% = \frac{50}{3}\%$$

Expressing the Result as a Mixed Fraction

Converting the improper fraction $\frac{50}{3}$ to a mixed fraction:

$$\frac{50}{3} = 16\frac{2}{3}$$

Therefore, the percentage loss is $16\frac{2}{3}\%$.

37. Answer: d

Explanation:

Dictionary Word Ordering Explained

Arranging words like Process, Possess, Purpose, and Propose in English dictionary order involves comparing them letter by letter from the start.

Comparing Words Alphabetically

Step 1: Compare Second Letters

All words begin with 'P'. We examine the second letter:

- Possess ('o')
- Process ('r')
- Propose ('r')
- Purpose ('u')

Alphabetically, 'o' < 'r' < 'u'. This places 'Possess' first and 'Purpose' last among these words. The sequence begins as: Possess, {Process, Propose}, Purpose.

Step 2: Compare 'Process' and 'Propose'

These two words both start with 'Pr'. We compare the subsequent letters:

- Process: P-r-o-c...
- Propose: P-r-o-p...

Since 'c' comes before 'p' in the alphabet, 'Process' is placed before 'Propose'.

Final Dictionary Sequence

Integrating all comparisons yields the final correct dictionary order:

1. Possess

2. Process
3. Propose
4. Purpose

38. Answer: c

Explanation:

The problem asks us to find the value of 'x' in the given equation involving mixed fractions.

Step 1: Convert Mixed Fractions to Improper Fractions

First, convert all mixed fractions to improper fractions to simplify calculations:

- $1\frac{1}{5} = \frac{6}{5}$
- $3\frac{2}{4} = 3\frac{1}{2} = \frac{7}{2}$
- $1\frac{3}{4} = \frac{7}{4}$
- $3\frac{1}{8} = \frac{25}{8}$
- $1\frac{1}{7} = \frac{8}{7}$

Step 2: Rewrite the Equation

Substitute the improper fractions back into the original equation:

$$\frac{6}{5} - \frac{7}{2} \div \frac{7}{4} \div \left(x + \frac{25}{8}\right) \div \frac{8}{7} = 1$$

Step 3: Simplify Division Operations (Left to Right)

Address the division operations sequentially. Remember that division by a fraction is equivalent to multiplication by its reciprocal.

First division: $\frac{7}{2} \div \frac{7}{4} = \frac{7}{2} \times \frac{4}{7} = \frac{4}{2} = 2$

The equation becomes: $\frac{6}{5} - 2 \div \left(x + \frac{25}{8}\right) \div \frac{8}{7} = 1$

Next division: $2 \div \left(x + \frac{25}{8}\right) = \frac{2}{x + \frac{25}{8}}$

The equation is now: $\frac{6}{5} - \frac{2}{x + \frac{25}{8}} \div \frac{8}{7} = 1$

Final division: $\frac{2}{x + \frac{25}{8}} \div \frac{8}{7} = \frac{2}{x + \frac{25}{8}} \times \frac{7}{8} = \frac{14}{8\left(x + \frac{25}{8}\right)} = \frac{7}{4\left(x + \frac{25}{8}\right)}$

The simplified equation is: $\frac{6}{5} - \frac{7}{4\left(x + \frac{25}{8}\right)} = 1$

Step 4: Isolate the Term Containing 'x'

Rearrange the equation to isolate the term with 'x':

$$\frac{6}{5} - 1 = \frac{7}{4\left(x + \frac{25}{8}\right)}$$

$$\frac{6}{5} - \frac{5}{5} = \frac{1}{5}$$

$$\text{So, } \frac{1}{5} = \frac{7}{4\left(x + \frac{25}{8}\right)}$$

Step 5: Solve for 'x'

Cross-multiply to solve for 'x':

$$1 \times 4\left(x + \frac{25}{8}\right) = 5 \times 7$$

$$4\left(x + \frac{25}{8}\right) = 35$$

Divide both sides by 4:

$$x + \frac{25}{8} = \frac{35}{4}$$

Isolate 'x':

$$x = \frac{35}{4} - \frac{25}{8}$$

Find a common denominator (8):

$$x = \frac{35 \times 2}{4 \times 2} - \frac{25}{8} = \frac{70}{8} - \frac{25}{8}$$

$$x = \frac{70 - 25}{8} = \frac{45}{8}$$

Step 6: Convert Result to Mixed Fraction

Convert the improper fraction back to a mixed fraction:

$$x = \frac{45}{8} = 5\frac{5}{8}$$

Therefore, the value of x is $5\frac{5}{8}$.

39. Answer: d

Explanation:

To solve this problem, we need to find the second term of a number sequence that leaves specific remainders when divided by 2, 3, and 8 respectively. Let's break down the problem and find a number that satisfies all these conditions.

1. We need a number that, when divided by 2, leaves a remainder of 1. In modular arithmetic, this can be expressed as:

$$x \equiv 1 \pmod{2}$$
2. We also need the same number to leave a remainder of 2 when divided by 3:

$$x \equiv 2 \pmod{3}$$
3. Additionally, the number should leave a remainder of 7 when divided by 8:

$$x \equiv 7 \pmod{8}$$
4. To solve for x that satisfies all these congruences, we look for a common value. Since the moduli (2, 3, and 8) are relatively prime, we can use the Chinese Remainder Theorem. However, an easier method is to test values manually.
5. We start with the largest modulus, 8, and verify which numbers also satisfy the other two conditions:
 - Numbers of the form $8k + 7$ satisfy $x \equiv 7 \pmod{8}$.
 - Try $x = 7$:
 $7 \pmod{2} = 1$ and $7 \pmod{3} = 1$ (does not satisfy $x \equiv 2 \pmod{3}$, hence discard).
 - Try $x = 15$:
 $15 \pmod{2} = 1$ and $15 \pmod{3} = 0$ (does not satisfy $x \equiv 2 \pmod{3}$, hence

discard).

- Try $x = 23$:
 $23 \bmod 2 = 1$ and $23 \bmod 3 = 2$ (satisfies all conditions).
- Try $x = 31$:
 $31 \bmod 2 = 1$ and $31 \bmod 3 = 1$ (does not satisfy $x \equiv 2 \pmod{3}$, hence discard).
- Continue this process till $x = 47$:
 $47 \bmod 2 = 1$, $47 \bmod 3 = 2$, and $47 \bmod 8 = 7$ (satisfies all conditions).

6. Therefore, the second term in this sequence is 47, which satisfies all the given conditions. Hence, the correct answer is 47.

40. Answer: c

Explanation:

Let's analyze the given statements and conclusions to determine which conclusion logically follows:

- **Statements:**
 1. All boys are chefs.
 2. All chefs are villagers.
- **Conclusions:**
 1. All boys are villagers.
 2. All chefs are boys.

We will assess each conclusion based on the given statements:

1. Conclusion 1: All boys are villagers.

- From Statement 1, we know that all boys are chefs.
- From Statement 2, we know that all chefs are villagers.
- By combining these two statements, we can conclude that since all boys are chefs and all chefs are villagers, all boys must be villagers.
- Therefore, Conclusion 1 logically follows from the statements.

2. Conclusion 2: All chefs are boys.

- Statement 1 only implies that all boys are chefs, but it does not suggest the reverse: that all chefs must be boys.
- Statement 2 further states that all chefs are villagers, which does not limit chefs to only being boys.
- Since there's no information directly tying chefs solely to boys, we cannot conclude that all chefs are boys based on the given statements.
- Therefore, Conclusion 2 does not follow from the statements.

Conclusion: Only conclusion 1 follows.

41. Answer: b

Explanation:

August Kranti: Understanding the Movement Name

The historical event known as the **August Kranti** is also widely recognized by another name.

- The **August Kranti** refers to the call given by Mahatma Gandhi on August 8, 1942, for immediate independence from British rule.
- This movement is synonymous with the **Quit India Movement** (also known as 'Bharat Chhodo Andolan').
- Therefore, the August Kranti Movement is also known as the **Quit India Movement**.

The correct option is the one that names the Quit India Movement.

42. Answer: d

Explanation:

Finding the Value of Sin 15°

To find the value of $\sin 15^\circ$, we can use the angle subtraction formula for sine, which is $\sin(A - B) = \sin A \cos B - \cos A \sin B$. We can express 15° as the difference between two standard angles, such as $45^\circ - 30^\circ$.

Let $A = 45^\circ$ and $B = 30^\circ$.

Applying the formula:

$$\sin 15^\circ = \sin(45^\circ - 30^\circ) = \sin 45^\circ \cos 30^\circ - \cos 45^\circ \sin 30^\circ$$

We know the standard values:

- $\sin 45^\circ = \frac{\sqrt{2}}{2}$
- $\cos 30^\circ = \frac{\sqrt{3}}{2}$
- $\cos 45^\circ = \frac{\sqrt{2}}{2}$
- $\sin 30^\circ = \frac{1}{2}$

Substitute these values into the equation:

$$\sin 15^\circ = \left(\frac{\sqrt{2}}{2}\right) \left(\frac{\sqrt{3}}{2}\right) - \left(\frac{\sqrt{2}}{2}\right) \left(\frac{1}{2}\right)$$

$$\sin 15^\circ = \frac{\sqrt{6}}{4} - \frac{\sqrt{2}}{4}$$

$$\sin 15^\circ = \frac{\sqrt{6}-\sqrt{2}}{4}$$

Thus, the value of $\sin 15^\circ$ is $\frac{\sqrt{6}-\sqrt{2}}{4}$.

43. Answer: a

Explanation:

Number Series Pattern

To find the next number in the series 2, 6, 12, 20, let's analyze the difference between consecutive terms.

- The difference between the first two terms is $6 - 2 = 4$.

- The difference between the second and third terms is $12 - 6 = 6$.
- The difference between the third and fourth terms is $20 - 12 = 8$.

The differences form a sequence: 4, 6, 8. This sequence increases by 2 for each step.

The next difference in this pattern will be $8 + 2 = 10$.

To find the next number in the original series, we add this next difference to the last term:

Next number = Last term + Next difference

Next number = $20 + 10 = 30$.

Thus, the number that will come next in the series is 30.

44. Answer: a

Explanation:

Analyzing the Number Series Pattern

The given number series is 4, 27, 16, 125, ?. We need to identify the pattern to find the next number.

Identifying the Interleaved Pattern

Let's examine the numbers based on their position in the series:

- Position 1: 4
- Position 2: 27
- Position 3: 16
- Position 4: 125
- Position 5: ?

Observe two interleaved patterns:

- **Odd positions (1st, 3rd, 5th):** The numbers are 4, 16, ?. These are perfect squares: $2^2 = 4$, $4^2 = 16$. The bases are increasing by 2 ($2 \rightarrow 4$).
- **Even positions (2nd, 4th):** The numbers are 27, 125. These are perfect cubes: $3^3 = 27$, $5^3 = 125$. The bases are increasing by 2 ($3 \rightarrow 5$).

Calculating the Next Term

The pattern progresses as follows:

- Term 1: $2^2 = 4$
- Term 2: $3^3 = 27$
- Term 3: $4^2 = 16$
- Term 4: $5^3 = 125$

Following this alternating square/cube pattern with increasing bases (2, 3, 4, 5), the next term (at the 5th position) should be a square (n^2) using the next base number (6).

- Term 5: 6^2

Calculating the value:

$$6^2 = 36$$

Therefore, the number that will come next in the series is 36.

45. Answer: c

Explanation:

Algebraic Manipulation: Finding ab

We are given two equations:

- $a + b = 5$
- $a^2 - b^2 = 75$

Our goal is to find the value of the product ab .

Using Difference of Squares

The second equation involves the difference of squares, which can be factored as:

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

Substitute the known values into this formula:

$$75 = (a - b)(5)$$

Solving for $(a - b)$

Divide both sides by 5 to find the value of $(a - b)$:

$$a - b = \frac{75}{5}$$

$$a - b = 15$$

Solving the System of Equations

Now we have a system of two linear equations:

1. $a + b = 5$

2. $a - b = 15$

Add the two equations together to eliminate b :

$$(a + b) + (a - b) = 5 + 15$$

$$2a = 20$$

Solve for a :

$$a = \frac{20}{2} = 10$$

Substitute the value of a (which is 10) back into the first equation ($a + b = 5$):

$$10 + b = 5$$

Solve for b :

$$b = 5 - 10 = -5$$

Calculating the Product ab

Finally, calculate the product ab using the values we found for a and b :

$$ab = (10)(-5)$$

$$ab = -50$$

Therefore, the value of ab is -50 .

46. Answer: a

Explanation:

Sulphur Amino Acid Identification

The question asks to identify the amino acid that contains sulfur from the given options. Amino acids are the building blocks of proteins, and their side chains determine their properties. Some amino acids contain specific elements like sulfur.

Amino Acid Analysis

- **Cysteine:** This amino acid has a side chain containing a thiol group ($-SH$), which includes a sulfur atom. It is known as a sulfur-containing amino acid.
- **Histidine:** This amino acid contains an imidazole ring, which has nitrogen atoms but lacks sulfur.
- **Tryptophan:** This amino acid features an indole ring structure, containing nitrogen but no sulfur.
- **Serine:** This amino acid has a primary alcohol group ($-CH_2OH$) in its side chain and does not contain sulfur.

Conclusion

Based on the side chain structures, **Cysteine** is the only amino acid among the options provided that contains sulfur.

47. Answer: b

Explanation:

Nomenclature Introduced By Carolus Linnaeus

The question asks about the scientist who established the current system for scientifically naming organisms.

- The system used today is called **binomial nomenclature**, a formal system for naming species of living things by giving each a name composed of two parts, both of which use Latin grammatical forms.
- This system was formalized and widely adopted thanks to the work of **Carolus Linnaeus**.
- He is often referred to as the "Father of Taxonomy" for his role in developing the system of binomial nomenclature and classifying organisms.
- While other scientists like George Washington Carver, Marie Curie, and Charles Darwin made significant contributions to science, they are not credited with introducing the modern system of scientific naming.

Therefore, **Carolus Linnaeus** is the scientist credited with introducing the system of scientific nomenclature used today.

48. Answer: d

Explanation:

Sucrose Molecular Structure

Sucrose is a common disaccharide, a type of sugar. It is formed by joining two simpler sugar units, namely glucose and fructose.

Determining Carbon Atoms in Sucrose

The chemical formula for both glucose and fructose is $C_6H_{12}O_6$. During the formation of sucrose from glucose and fructose, one molecule of water (H_2O) is removed.

- Glucose unit: $C_6H_{12}O_6$
- Fructose unit: $C_6H_{12}O_6$
- Combined atoms before water removal: $C_{6+6}H_{12+12}O_{6+6} = C_{12}H_{24}O_{12}$
- Water molecule removed: H_2O
- Resulting sucrose formula: $C_{12}H_{24}O_{12} - H_2O = C_{12}H_{22}O_{11}$

The molecular formula for sucrose is therefore $C_{12}H_{22}O_{11}$.

In this formula, the subscript '12' following the element symbol 'C' indicates the number of carbon atoms present in one molecule of sucrose.

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49. Answer: b

Explanation:

Identifying Akbar's Zarrin Qalam Calligrapher

The question asks to identify a specific artist from Emperor Akbar's court, renowned for calligraphy and honored with the title 'Zarrin Qalam', meaning 'golden pen'. This title specifically recognizes exceptional skill in handwriting and artistic script.

Key Figure in Akbar's Court

- The artists listed are associated with Akbar's court, a period known for patronage of arts and literature.
- Abul Fazal was a historian and scholar, not primarily a calligrapher.
- Daswant and Basawan were prominent painters in Akbar's court.
- **Muhammad Husayn** was celebrated for his mastery of calligraphy and was indeed bestowed the prestigious title 'Zarrin Qalam' by Akbar.

Conclusion

Based on historical accounts, Muhammad Husayn is recognized as the finest calligrapher at Akbar's court who received the title 'Zarrin Qalam'.

50. Answer: c

Explanation:

Indian States Minimum Area Comparison

To identify the Indian state with the minimum area among the given options, we compare their approximate land areas.

State	Area (approx. in km ²)
Rajasthan	342, 239
Maharashtra	307, 713
Uttar Pradesh	240, 928
Madhya Pradesh	308, 252

Area Analysis

Comparing the areas:

- Rajasthan: 342,239 km²
- Madhya Pradesh: 308,252 km²
- Maharashtra: 307,713 km²
- Uttar Pradesh: 240,928 km²

Uttar Pradesh has the smallest area among these four states.

Minimum Area State Identification

Based on the area comparison, Uttar Pradesh has the minimum area.

51. Answer: d

Explanation:

Article 17 of the Indian Constitution Explained

Core Provision

Article 17 of the Indian Constitution fundamentally addresses a specific social evil. It states that "**Untouchability**" is **abolished** and forbids its practice in any form.

Enforcement

The Constitution further mandates that the enforcement of any disability arising from "Untouchability" shall be an offence punishable by law. Parliament has enacted laws, such as the Untouchability (Offences) Act, 1955 (now the Protection of Civil Rights Act, 1955), to give effect to this provision.

Focus of Article 17

Therefore, Article 17 directly concerns the **abolition of the practice of untouchability**.

Comparison with Other Options

- The *right to education* is guaranteed under Article 21A.
- The *right to freedom of religion* is covered by Articles 25–28.
- The provision for a *joint sitting of both houses* is found in Article 108.

These options correspond to different articles and are distinct from the subject matter of Article 17.

52. Answer: b

Explanation:

Satellite Identification using X-band SAR

The question asks to identify the satellite equipped with an X-band synthetic aperture radar (SAR). Synthetic Aperture Radar is a type of radar system that is used to create two-dimensional images of objects. It uses motion of the radar antenna relative to the target to achieve far greater spatial resolution than conventional radar imaging systems.

X-band Frequency and Application

The X-band refers to a specific range of microwave frequencies (typically 8 to 12 GHz). In SAR systems, the X-band is often chosen for its ability to provide high-resolution imagery and its sensitivity to surface characteristics, making it useful for applications like detailed terrain mapping and disaster monitoring.

RISAT-2B Payload

The **RISAT-2B** satellite, launched by the Indian Space Research Organisation (ISRO), is specifically designed for advanced remote sensing applications. Its primary payload includes a sophisticated X-band Synthetic Aperture Radar.

- **CARTOSAT-2B:** Primarily carries a panchromatic camera for high-resolution imaging.

- **RISAT-2B:** Features an X-band SAR payload for all-weather, day-and-night imaging capabilities.
- **INSAT-4B:** Part of the INSAT series, mainly used for telecommunication and broadcasting services.
- **GSAT-12:** A communication satellite providing services like remote education and telemedicine.

Conclusion

Based on its instrumentation, **RISAT-2B** is the satellite among the options that utilizes X-band synthetic aperture radar technology.

53. Answer: c

Explanation:

Value of $3(x+y)$ Calculation

The problem requires finding the value of the expression $3(x+y)$ given specific values for x and y . The values of x and y involve fractions with square roots in the denominator. We need to simplify x and y first.

Step 1: Rationalize x

Given $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$. To rationalize the denominator, multiply the numerator and denominator by the conjugate of the denominator, which is $\sqrt{3} + 1$.

$$x = \frac{\sqrt{3}+1}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1} = \frac{(\sqrt{3}+1)^2}{(\sqrt{3})^2-1^2}$$

Expand the numerator and simplify the denominator:

$$x = \frac{(\sqrt{3})^2+2(\sqrt{3})(1)+1^2}{3-1} = \frac{3+2\sqrt{3}+1}{2} = \frac{4+2\sqrt{3}}{2}$$

Simplify the fraction:

$$x = 2 + \sqrt{3}$$

Step 2: Rationalize y

Given $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$. To rationalize the denominator, multiply the numerator and denominator by the conjugate of the denominator, which is $\sqrt{3} - 1$.

$$y = \frac{\sqrt{3}-1}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1} = \frac{(\sqrt{3}-1)^2}{(\sqrt{3})^2-1^2}$$

Expand the numerator and simplify the denominator:

$$y = \frac{(\sqrt{3})^2 - 2(\sqrt{3})(1) + 1^2}{3-1} = \frac{3-2\sqrt{3}+1}{2} = \frac{4-2\sqrt{3}}{2}$$

Simplify the fraction:

$$y = 2 - \sqrt{3}$$

Step 3: Calculate sum x + y

Now, add the simplified values of x and y :

$$x + y = (2 + \sqrt{3}) + (2 - \sqrt{3})$$

Combine like terms:

$$x + y = 2 + 2 + \sqrt{3} - \sqrt{3} = 4$$

Step 4: Calculate final expression 3(x + y)

Finally, multiply the sum $(x + y)$ by 3:

$$3(x + y) = 3 \times 4$$

$$3(x + y) = 12$$

The value of $3(x + y)$ is 12.

54. Answer: d

Explanation:

EMISAT Satellite Type Identification

EMISAT is specifically designed and launched by ISRO as an **Intelligence satellite**.

Its primary role involves electronic intelligence gathering, serving strategic purposes for the nation.

The designation highlights its function in intercepting and analyzing signals intelligence (SIGINT).

55. Answer: b

Explanation:

Nibble to Bits Conversion

To solve this, we need to know the relationship between nibbles and bits.

- 1 nibble is equal to 4 bits.

Calculating Total Bits

We are given 10 nibbles and need to find the equivalent number of bits.

Using the conversion factor:

Total Bits = Number of Nibbles $\times$ Bits per Nibble

Total Bits = 10×4

Total Bits = 40

Therefore, 10 nibbles are equal to 40 bits.

56. Answer: d

Explanation:

NHAI Establishment Year

The question asks for the year the National Highways Authority of India (NHAI) was set up.

NHAI Setup Details

The National Highways Authority of India (NHAI) was constituted on **15th March 1988**, established by an Act of Parliament, the National Highways Authority of India Act, 1956.

- **Establishment Year:** 1988

Therefore, NHAI was set up in **1988**.

57. Answer: a

Explanation:

Perimeter Calculation for Square Park

This solution calculates the perimeter of a square park given the area of a surrounding path and its width.

Problem Variables

- Let the side length of the square park be s meters.
- The width of the surrounding path is 1.5 m.
- The area of the path is 225 m^2 .
- The side length of the larger square (park + path) is $s + 2 \times 1.5 = s + 3$ meters.

Area Equation

The area of the path is the difference between the area of the outer square (park + path) and the area of the inner square (park).

- Area of outer square = $(s + 3)^2 \text{ m}^2$
- Area of inner square (park) = $s^2 \text{ m}^2$
- Area of path = Area of outer square - Area of inner square
- $(s + 3)^2 - s^2 = 225$

Solving for Side Length s

Expand the equation and solve for s .

- $(s^2 + 6s + 9) - s^2 = 225$
- $6s + 9 = 225$
- $6s = 225 - 9$
- $6s = 216$
- $s = \frac{216}{6}$
- $s = 36 \text{ m}$

Calculating Perimeter

The perimeter of the square park is $4 \times s$.

- Perimeter = 4×36
- Perimeter = 144 m

The perimeter of the park is **144 m**.

58. Answer: d

Explanation:

Percentage Calculation Explained

This problem asks us to find the value corresponding to 90% of a number, given that 82% of the same number is 738.

Step 1: Find the Unknown Number

Let the unknown number be represented by ' x '. We are given that 82% of x is 738.

We can write this as an equation:

$$82\% \times x = 738$$

Convert the percentage to a decimal:

$$0.82 \times x = 738$$

To find x , divide 738 by 0.82:

$$x = \frac{738}{0.82}$$

$$x = 900$$

So, the number is 900.

Step 2: Calculate 90% of the Number

Now we need to find 90% of the number we found, which is 900.

Calculate 90% of 900:

$$90\% \times 900$$

Convert the percentage to a decimal:

$$0.90 \times 900$$

$$810$$

Alternative Method: Using Ratios

We can solve this more directly using ratios without explicitly finding the number.

If 82% corresponds to 738, we can find what 1% corresponds to:

$$1\% \rightarrow \frac{738}{82}$$

$$1\% \rightarrow 9$$

Now, to find 90%, multiply the value of 1% by 90:

$$90\% \rightarrow 90 \times 9$$

$$90\% \rightarrow 810$$

Final Answer

Therefore, 90% of the number is 810.

59. Answer: a

Explanation:

Solution: Determining the Day of the Week

The problem requires finding the day of the week for 7th March 2019, given that 4th March 2018 was a Wednesday.

Step 1: Calculate Day Shift for One Full Year

First, determine the day of the week for 4th March 2019.

The duration between 4th March 2018 and 4th March 2019 is exactly one year.

The year 2019 is not a leap year, so there are 365 days in this period.

To find the shift in the day of the week, calculate the remainder of 365 days divided by 7:

$$365 \bmod 7$$

$$365 = (52 \times 7) + 1$$

The remainder is 1. This means 4th March 2019 will be exactly 1 day after Wednesday.

Therefore, 4th March 2019 falls on a Thursday.

Step 2: Calculate Day Shift to Target Date

Next, calculate the number of days between 4th March 2019 and the target date, 7th March 2019.

Number of days = Target Date Day - Start Date Day

$$\text{Number of days} = 7 - 4 = 3 \text{ days}$$

Step 3: Determine the Final Day

Starting from the day of the week for 4th March 2019 (Thursday), count forward 3 days:

- 4th March 2019: Thursday
- 5th March 2019: Friday
- 6th March 2019: Saturday
- 7th March 2019: Sunday

Thus, 7th March 2019 will be a Sunday.

60. Answer: d

Explanation:

NEERI Location Revealed

The National Environmental Engineering Research Institute, commonly known as NEERI, is a premier research organization.

NEERI's main campus is located in Nagpur.

This institute plays a vital role in environmental science and engineering research within India.

61. Answer: b

Explanation:

Simple Interest Calculation

The problem asks us to determine how many times an initial investment will grow in 12 years, given that it triples in 8 years under simple interest.

Reasoning with Simple Interest

Simple interest means the interest earned each year is constant and calculated based on the original principal amount. The total amount grows linearly with time.

- Let the principal amount be P .
- If the sum triples in 8 years, the final amount A_8 is $3P$.
- The simple interest earned in 8 years is $SI_8 = A_8 - P = 3P - P = 2P$.

Calculating Growth Over Time

We can find the rate of interest or use the proportionality of simple interest with time.

Method 1: Using Rate

1. Calculate the annual interest rate R . Using $SI = \frac{P \times R \times T}{100}$, we have $2P = \frac{P \times R \times 8}{100}$.
2. Simplifying, $2 = \frac{R \times 8}{100}$, which gives $R = \frac{2 \times 100}{8} = 25\%$.
3. Now, calculate the simple interest for 12 years: $SI_{12} = \frac{P \times 25 \times 12}{100} = \frac{300P}{100} = 3P$.
4. The total amount after 12 years is $A_{12} = P + SI_{12} = P + 3P = 4P$.

Method 2: Proportionality

1. Simple interest is directly proportional to time.
2. In 8 years, the interest earned is $2P$ (to make the sum $3P$).
3. Let the interest earned in 12 years be SI_{12} .
4. Set up a proportion: $\frac{SI_{12}}{12 \text{ years}} = \frac{2P}{8 \text{ years}}$.
5. Solve for SI_{12} : $SI_{12} = \frac{2P}{8} \times 12 = \frac{24P}{8} = 3P$.
6. The total amount after 12 years is $A_{12} = P + SI_{12} = P + 3P = 4P$.

Conclusion

In 12 years, the sum will be **4 times** itself.

62. Answer: c

Explanation:

To solve the problem, we need to find the value of $(a - \frac{1}{a})$ given that $(a^2 + \frac{1}{a^2}) = 18$.

We begin by using the identity:

$$a^2 + \frac{1}{a^2} = (a - \frac{1}{a})^2 + 2.$$

Given that $a^2 + \frac{1}{a^2} = 18$, we can write:

$$(a - \frac{1}{a})^2 + 2 = 18$$

Simplifying the equation, we get:

$$(a - \frac{1}{a})^2 = 18 - 2$$

$$(a - \frac{1}{a})^2 = 16$$

Taking the square root on both sides, we find:

$$(a - \frac{1}{a}) = \pm 4$$

The problem does not specify whether a is positive or negative, but typically in such questions, we consider the principal (positive) value. Therefore,;

$$a - \frac{1}{a} = 4$$

Thus, the correct answer is 4.

Based on the analysis and calculation above, the correct option is 4.

63. Answer: d

Explanation:

Geography MCQs: Identify Incorrect City–River Match

This question requires identifying the city that is incorrectly paired with the river it is located on.

Option Analysis

- **Option 1: Surat – Tapti river**
This is a **correct** match. Surat is a major city located on the banks of the Tapti River in Gujarat.
- **Option 2: Lucknow – Gomati river**
This is a **correct** match. Lucknow, the capital of Uttar Pradesh, lies on the Gomati River.
- **Option 3: Ujjain – Kshipra river**
This is a **correct** match. Ujjain, an ancient city in Madhya Pradesh, is situated on the Kshipra River.
- **Option 4: Jabalpur – Jhelum river**
This is an **incorrect** match. Jabalpur is located on the **Narmada River**, not the Jhelum River. The Jhelum River flows through the Union Territory of Jammu and Kashmir and parts of Pakistan.

Incorrect Match Identified

Based on the analysis, the pair that is NOT correctly matched is Jabalpur with the Jhelum river.

Therefore, the incorrect match is: Jabalpur – Jhelum river.

64. Answer: c

Explanation:

All England Open Badminton 2019 Men's Singles Winner

The question asks to identify the winner of the Men's Singles title at the All England Open Badminton Championships in 2019.

Event: All England Open Badminton Championships 2019

Category: Men's Singles

Winner: Kento Momota

Kento Momota of Japan won the Men's Singles title at the 2019 All England Open Badminton Championships.

65. Answer: c

Explanation:

Damodar Valley Corporation: Core Operations

The Damodar Valley Corporation (DVC) is a government organization primarily focused on the integrated development of the Damodar River Valley. Its major operational activities revolve around power generation and flood control.

Key Operational Focus of DVC

DVC's significant operational activities include:

- **Thermal Power Generation:** DVC operates multiple thermal power stations, making power generation its most prominent function. These stations utilize coal to produce electricity.
- **Hydroelectric Power Generation:** DVC also generates hydroelectric power from its dams.
- **Flood Management:** The corporation manages dams for flood control in the Damodar Valley region.
- **Water Supply:** It provides water for irrigation and industrial use.

Based on its core functions, DVC operates **thermal power stations**.

Analysis of Options

- **Fertilizer Plants:** DVC is not primarily known for operating fertilizer plants.
- **Cement Plants:** Cement production is not a core activity of DVC.
- **Thermal Power Stations:** This aligns with DVC's major role in electricity generation.
- **Pesticide Plants:** DVC does not operate pesticide plants.

Therefore, the most accurate description of DVC's operations among the choices is **thermal power stations**.

Your Personal Exams Guide

66. Answer: a

Explanation:

Domain of Cosecant Function

The cosecant function, denoted as $\operatorname{cosec} x$, is the reciprocal of the sine function.

Mathematically, it is defined as:

$$\operatorname{cosec} x = \frac{1}{\sin x}$$

The domain of a function includes all possible input values (x) for which the function is defined. The function $\operatorname{cosec} x$ is undefined when its denominator, $\sin x$, equals zero.

The sine function, $\sin x$, equals zero at integer multiples of π . That is:

$$\sin x = 0 \quad \text{when} \quad x = n\pi, \quad \text{where } n \in \mathbb{Z} \text{ (Z represents the set of integers)}$$

Therefore, the values $n\pi$ ($\dots, -\pi, 0, \pi, 2\pi, \dots$) must be excluded from the domain of $\operatorname{cosec} x$.

The set of all real numbers is represented by $\mathbb{R}$. The domain of $\operatorname{cosec} x$ is all real numbers except for these values where $\sin x = 0$.

$$\text{Domain of } \operatorname{cosec} x = \mathbb{R} - \{n\pi | n \in \mathbb{Z}\}$$

This corresponds to Option 1.

67. Answer: b

Explanation:

Prime Number Identification

A prime number is a natural number greater than 1 that has exactly two distinct positive divisors: 1 and itself. To find the prime number among the given options, we need to test each number for divisibility by numbers other than 1 and itself.

Checking the Options for Primality

We examine each provided number:

- **Option 1: 213**

The sum of the digits is $2 + 1 + 3 = 6$. Since 6 is divisible by 3, 213 is divisible by 3. ($213 \div 3 = 71$). Therefore, 213 is not a prime number.

- **Option 2: 173**

Test divisibility by small prime numbers:

- Not divisible by 2 (it's odd).
- Sum of digits is $1 + 7 + 3 = 11$, not divisible by 3.
- Does not end in 0 or 5, so not divisible by 5.
- $173 \div 7 = 24$ remainder 5.
- $173 \div 11 = 15$ remainder 8.
- $173 \div 13 = 13$ remainder 4.

The square root of 173 is approximately 13.15. Since 173 is not divisible by any prime number less than or equal to its square root, 173 is a prime number.

- **Option 3: 123**

The sum of the digits is $1 + 2 + 3 = 6$. Since 6 is divisible by 3, 123 is divisible by 3. ($123 \div 3 = 41$). Therefore, 123 is not a prime number.

- **Option 4: 143**

Test divisibility:

- Not divisible by 2, 3, 5.
- $143 \div 7 = 20$ remainder 3.
- $143 \div 11 = 13$.

Since 143 is divisible by 11 (and 13), it is not a prime number.

Conclusion

Based on the divisibility tests, only the number 173 has exactly two divisors (1 and 173), making it the prime number among the given options.

68. Answer: d

Explanation:

Median Calculation for Asymmetrical Distribution

This problem involves finding the median of a distribution when the mean and mode are known, and the distribution is moderately asymmetrical. We can use Karl Pearson's empirical relationship for this calculation.

Given Information

- Mode = 25.2
- Mean = 27.5
- Distribution type: Moderately asymmetrical

Karl Pearson's Empirical Formula

For moderately asymmetrical distributions, the relationship between the mean, median, and mode is given by the formula:

$$\text{Mean} - \text{Mode} = 3 \times (\text{Mean} - \text{Median})$$

Step-by-Step Calculation

1. Substitute the given values of Mean and Mode into the formula:

$$27.5 - 25.2 = 3 \times (27.5 - \text{Median})$$

2. Calculate the difference between the mean and the mode:

$$2.3 = 3 \times (27.5 - \text{Median})$$

3. Isolate the term containing the Median by dividing both sides by 3:

$$\frac{2.3}{3} = 27.5 - \text{Median}$$

$$0.7666... = 27.5 - \text{Median}$$

4. Rearrange the equation to solve for the Median:

$$\text{Median} = 27.5 - 0.7666...$$

5. Calculate the final value of the Median:

$$\text{Median} \approx 26.7333...$$

Rounding to two decimal places, the Median is 26.73.

Conclusion

The value of the median for this moderately asymmetrical distribution is approximately 26.73.

69. Answer: d

Explanation:

Letter Series Pattern Analysis

The task is to find the next term in the given letter series by identifying the underlying pattern.

The series provided is: MU, KS, IQ, GO, ---

Analyzing the Letter Series MU, KS, IQ, GO

We can decipher the pattern by looking at the alphabetical positions of the letters in each pair.

First Letter Progression

Consider the first letter of each term in the series:

- M is the 13th letter of the alphabet.
- K is the 11th letter.
- I is the 9th letter.
- G is the 7th letter.

The sequence of positions for the first letters is 13, 11, 9, 7. The pattern observed is a consistent decrease of 2 positions in each step.

Following this pattern, the next position should be $7 - 2 = 5$. The 5th letter in the alphabet is E.

Second Letter Progression

Now, let's examine the second letter of each term:

- U is the 21st letter of the alphabet.
- S is the 19th letter.
- Q is the 17th letter.
- O is the 15th letter.

The sequence of positions for the second letters is 21, 19, 17, 15. This pattern also shows a consistent decrease of 2 positions in each step.

Following this pattern, the next position should be $15 - 2 = 13$. The 13th letter in the alphabet is M.

Determining the Missing Term

By combining the next letter derived from the first letter progression (E) and the next letter derived from the second letter progression (M), the complete missing term is EM.

Term	First Letter	Position	Difference	Second Letter	Position	Difference
MU	M	13	-2	U	21	-2
KS	K	11		S	19	
IQ	I	9	-2	Q	17	-2
GO	G	7		O	15	
EM (Next Term)	E	5		M	13	

70. Answer: d

Explanation:

Identify Incorrect GST Rate Slab

The question asks to identify the rate that is NOT a standard Goods and Services Tax (GST) slab in India.

Standard Indian GST Rate Slabs

GST in India follows specific rate slabs for taxation. The commonly applied rates are:

- 0%
- 5%
- 12%
- 18%
- 28%

Additionally, there are certain cess charges on specific goods, often making the final applicable rate higher than the standard slabs.

Analyzing the Options

Let's compare the given options with the standard GST rate slabs:

- Option 1 (18%): This is a standard GST rate slab.
- Option 2 (28%): This is the highest standard GST rate slab.
- Option 3 (5%): This is a standard GST rate slab.
- Option 4 (10%): This rate is not among the standard GST slabs in India.

Conclusion

Based on the standard GST rate structure in India, 10% is not a prescribed tax slab. Therefore, the rate 10% is the correct answer.

71. Answer: a

Explanation:

Acting Theatre Analogy Explained

This question tests your ability to identify relationships between words (analogy). We need to find the relationship between the first pair of words, **Music** and **Concert**, and apply it to find the missing word related to **Acting**.

Analyzing the Relationship

- **Music : Concert** The relationship here is: **Music** is typically performed or experienced at a **Concert**. A concert is a venue or event for music performance.

Applying the Relationship

- **Acting : ?** We need to find a word that represents the place or event where **Acting** is performed or experienced, similar to how a concert is for music.
- Option 1: **Theatre** – A theatre is a common and primary venue for acting performances. This matches the relationship.
- Option 2: **Song** – A song is related to music, not acting.
- Option 3: **Gymnastic** – This is a physical activity unrelated to the primary context of acting.
- Option 4: **Dance** – While dance can involve acting elements, it's a distinct performing art, and 'Theatre' is a more direct parallel to 'Concert' for acting.

Conclusion

Following the pattern (**Music : Concert :: Acting : ?**), the correct option is the place where acting is performed. Therefore, **Acting** is related to **Theatre** in the same way **Music** is related to **Concert**.

72. Answer: a

Explanation:

Identifying the Odd One Out: Farm Animals vs. Pet

The question requires identifying the animal that does not belong to the same primary category as the others.

Animal Classification

- **Farm Animals/Livestock:** Cow, Goat, Rabbit are commonly raised for agricultural purposes (milk, meat, wool, etc.).
- **Pet Animal:** Cat is typically kept as a domestic companion.

Reasoning

While all are mammals and common animals, the primary classification differs. Cows and goats are definitively livestock. Rabbits are often raised domestically for meat or fur, placing them closer to farm animals than pets in many contexts. Cats, however, are predominantly categorized as pets.

Therefore, the **Cat** is the odd one out based on its typical role as a pet rather than a farm animal or livestock.

73. Answer: c

Explanation:

Mean Calculation for Data Set

To find the mean (or average) of a set of values, you sum all the values and then divide by the total number of values.

Mean Formula

The formula for the mean ($\bar{x}$) is:

$$\bar{x} = \frac{\sum x}{n}$$

Where:

- $\sum x$ is the sum of all the values in the data set.
- n is the total number of values in the data set.

Step-by-Step Calculation

1. Sum the values:

The given values are -2.2, 4.2, 6.4, 8.3, and 10.5.

$$\sum x = (-2.2) + 4.2 + 6.4 + 8.3 + 10.5$$

$$\sum x = 27.2$$

2. Count the number of values:

There are 5 values in the data set.

$$n = 5$$

3. Divide the sum by the count:

$$\bar{x} = \frac{27.2}{5}$$

$$\bar{x} = 5.44$$

Result

The calculated mean for the given set of values is 5.44.

74. Answer: c

Explanation:

Identifying the Indian State Bordering China, Nepal, and Bhutan

The question asks to identify the Indian state that shares its borders with three specific countries: China, Nepal, and Bhutan.

Analyzing State Borders

Let's examine the borders of the given options:

- **Mizoram:** Shares borders primarily with Bangladesh and Myanmar. It does not border China, Nepal, or Bhutan.
- **Nagaland:** Borders Myanmar. It does not share borders with China, Nepal, or Bhutan.
- **Sikkim:** This state shares international borders with Nepal to the west, China (Tibet Autonomous Region) to the north and east, and Bhutan to the southeast.
- **Arunachal Pradesh:** Shares borders with China (Tibet Autonomous Region) to the north and east, and Bhutan to the west. It does not border Nepal.

Conclusion on Borders

Based on the border analysis:

- Sikkim borders China, Nepal, and Bhutan.
- Arunachal Pradesh borders China and Bhutan but not Nepal.
- Mizoram and Nagaland do not border any of these three countries.

Therefore, Sikkim is the only Indian state among the options that shares borders with China, Nepal, and Bhutan.

75. Answer: b

Explanation:

Simplifying the Fraction Sum

The problem asks to simplify the sum: $\frac{1}{5.8} + \frac{1}{8.11} + \frac{1}{11.14} + \frac{1}{14.17}$

Recognizing the Pattern

Observe the pattern in the denominators: each is a product of two numbers that differ by 3, and the first number increases sequentially (5, 8, 11, 14).

- $5.8 = 5 \times (5 + 3)$
- $8.11 = 8 \times (8 + 3)$
- $11.14 = 11 \times (11 + 3)$
- $14.17 = 14 \times (14 + 3)$

The general form of the terms is $\frac{1}{n(n+3)}$.

Applying Partial Fraction Decomposition

We can decompose the general term $\frac{1}{n(n+3)}$ using partial fractions:

$$\frac{1}{n(n+3)} = \frac{A}{n} + \frac{B}{n+3}$$

Multiplying both sides by $n(n+3)$ gives:

$$1 = A(n+3) + Bn$$

- Setting $n = 0$, we get $1 = A(3) \implies A = \frac{1}{3}$.
- Setting $n = -3$, we get $1 = B(-3) \implies B = -\frac{1}{3}$.

Therefore, the decomposition is:

$$\frac{1}{n(n+3)} = \frac{1}{3} \left(\frac{1}{n} - \frac{1}{n+3} \right)$$

Evaluating Each Term

Applying this decomposition to each term in the sum:

- $\frac{1}{5.8} = \frac{1}{3} \left(\frac{1}{5} - \frac{1}{8} \right)$
- $\frac{1}{8.11} = \frac{1}{3} \left(\frac{1}{8} - \frac{1}{11} \right)$
- $\frac{1}{11.14} = \frac{1}{3} \left(\frac{1}{11} - \frac{1}{14} \right)$
- $\frac{1}{14.17} = \frac{1}{3} \left(\frac{1}{14} - \frac{1}{17} \right)$

Summing the Series (Telescoping)

Add the decomposed terms. Notice that intermediate terms cancel out (this is a telescoping series):

$$\text{Sum} = \frac{1}{3} \left[\left(\frac{1}{5} - \frac{1}{8} \right) + \left(\frac{1}{8} - \frac{1}{11} \right) + \left(\frac{1}{11} - \frac{1}{14} \right) + \left(\frac{1}{14} - \frac{1}{17} \right) \right] \quad \text{Sum} = \frac{1}{3} \left(\frac{1}{5} - \frac{1}{17} \right)$$

Final Calculation

Calculate the remaining expression:

$$\text{Sum} = \frac{1}{3} \left(\frac{17-5}{5 \times 17} \right) \quad \text{Sum} = \frac{1}{3} \left(\frac{12}{85} \right) \quad \text{Sum} = \frac{4}{85}$$

76. Answer: d

Explanation:

Muhammad Yunus Nobel Prize Work

Muhammad Yunus received the Nobel Peace Prize for his groundbreaking efforts in the field of **microfinance**.

Pioneering Microfinance

- **Microfinance** involves providing financial services like loans, savings, and insurance to low-income individuals who lack access to traditional banking.
- Muhammad Yunus pioneered this concept, most notably through the founding of **Grameen Bank** in Bangladesh.
- His work aimed to empower the poor, particularly women, by providing them with the capital needed to start small businesses and improve their livelihoods.
- This approach challenges traditional economic models by focusing on poverty alleviation through financial inclusion.
- The Nobel Committee recognized this **pioneering work** for its potential to create economic and social development from below.

Therefore, Muhammad Yunus was awarded the Nobel Peace Prize for his pioneering work in **microfinance**.

77. Answer: c

Explanation:

Solving Linear Equations: Step-by-Step

We are given a system of three linear equations:

- Equation 1: $2x + y = 15$
- Equation 2: $y + 2z = 17$
- Equation 3: $x + 2y = 9$

The goal is to find the value of the expression $4x + 3y + z$.

Finding the Value of x

1. From Equation 1, express y in terms of x :

$$y = 15 - 2x$$

2. Substitute this expression for y into Equation 3:

$$x + 2(15 - 2x) = 9$$

3. Simplify and solve for x :

$$x + 30 - 4x = 9$$

$$-3x = 9 - 30$$

$$-3x = -21$$

$$x = \frac{-21}{-3}$$

$$x = 7$$

Finding the Value of y

1. Substitute the value of x (which is 7) back into the expression for y derived from Equation 1:

$$y = 15 - 2(7)$$

2. Calculate y :

$$y = 15 - 14$$

$$y = 1$$

Finding the Value of z

1. Substitute the value of y (which is 1) into Equation 2:

$$1 + 2z = 17$$

2. Solve for z :

$$2z = 17 - 1$$

$$2z = 16$$

$$z = \frac{16}{2}$$

$$z = 8$$

Calculating the Final Expression Value

Now substitute the values $x = 7$, $y = 1$, and $z = 8$ into the target expression $4x + 3y + z$:

$$4x + 3y + z = 4(7) + 3(1) + 8$$

$$= 28 + 3 + 8$$

$$= 31 + 8$$

$$= 39$$

The value of $4x + 3y + z$ is 39.

78. Answer: b

Explanation:

PNG File Type Identification

The question asks to identify the type of file associated with the ".PNG" file extension.

A file extension like ".PNG" is used by operating systems to indicate the format and type of a file.

- **PNG** stands for **Portable Network Graphics**.
- This format is specifically designed for graphics and images on the internet.
- It supports lossless data compression, transparency, and is widely used for web graphics, icons, and images requiring high detail.

Therefore, a ".PNG" file is recognized as an **image file**.

Referencing the options provided:

- Option 1: audio file – Incorrect. Audio files have extensions like .mp3, .wav.
- **Option 2: image file – Correct. .PNG is a standard image file format.**
- Option 3: batch file – Incorrect. Batch files typically have .bat or .cmd extensions.
- Option 4: video file – Incorrect. Video files have extensions like .mp4, .avi, .mov.

The correct classification for a file with the *.PNG* extension is an image file.

79. Answer: c

Explanation:

RTE Mandate Analysis

The statement indicates that the Right to Education (RTE) has made it compulsory for all children aged 6 to 14 years to be enrolled in schools. We need to determine if the given assumptions are implicitly contained within this statement.

Assumption I: Implicit Reasons for Compulsion

Assumption I: Enrollment needs to be made compulsory as children don't like education.

- The statement mentions the **compulsory nature** of enrollment mandated by RTE.
- However, the statement does not provide the specific **reason** why enrollment is compulsory or comment on children's feelings towards education.
- Compulsion could stem from various policy goals, not solely from children's alleged dislike of education.
- Therefore, this assumption is not necessarily implied by the statement.

Assumption II: Implicit Guarantee of Quality

Assumption II: Each child of the country will get quality Education.

- The statement focuses on **compulsory enrollment**, which means ensuring children attend school.
- Ensuring enrollment is the first step, but it does not automatically guarantee the **quality of education** provided.
- Quality education depends on factors like curriculum, teaching standards, and resources, which are not mentioned in the statement.
- Thus, this assumption is not necessarily implied by the statement.

Conclusion on Assumptions

Since neither Assumption I nor Assumption II logically follows directly from the given statement, neither is implicit.

80. Answer: d

Explanation:

Element Densities: Maximum Density Element

Density is defined as mass per unit volume. Comparing the densities of various elements helps identify which is the most compact.

Comparing Densities of Listed Elements

The approximate densities of the elements provided are:

Element	Symbol	Approximate Density (g/cm^3)
Lead	Pb	11.34
Platinum	Pt	21.45
Mercury	Hg	13.53
Osmium	Os	22.59

Maximum Density Identification

By comparing these values:

- Osmium exhibits the highest density ($22.59 \text{ g}/\text{cm}^3$).
- Platinum has the second highest density ($21.45 \text{ g}/\text{cm}^3$).
- Mercury's density is $13.53 \text{ g}/\text{cm}^3$.
- Lead has the lowest density among the options ($11.34 \text{ g}/\text{cm}^3$).

Thus, Osmium is the element with the **maximum density** among the given choices.

81. Answer: b

Explanation:

Finding Regular Polygon Sides from Interior Angle

This solution details how to determine the number of sides of a regular polygon when given the measure of each interior angle.

Calculating the Exterior Angle

In any regular polygon, an interior angle and its adjacent exterior angle sum up to 180° .

Given interior angle = 165° .

The formula for the exterior angle is:

Exterior Angle = $180^\circ - \text{Interior Angle}$

Exterior Angle = $180^\circ - 165^\circ = 15^\circ$.

Determining the Number of Sides

The sum of all exterior angles of any convex polygon is always 360° . For a regular polygon with n sides, all exterior angles are equal. Therefore, the measure of one exterior angle is $\frac{360^\circ}{n}$.

Using the calculated exterior angle:

$$15^\circ = \frac{360^\circ}{n}$$

To find the number of sides (n), we rearrange the formula:

$$n = \frac{360^\circ}{15^\circ}$$

$$n = 24$$

The regular polygon has 24 sides.

82. Answer: b

Explanation:

IAF Aircraft Certified for Blended Fuel

The AN-32 is the specific transport aircraft of the Indian Air Force (IAF) that has received certification to operate using blended aviation fuel.

This certification marks a significant step for the IAF in adopting more sustainable aviation practices. Blended aviation fuel typically involves a mix of conventional jet fuel and sustainable sources, aiming to reduce environmental impact.

Aircraft Details

- **AN-32:** A twin-engine turboprop military transport aircraft, widely used by the IAF. It is the variant certified for blended aviation fuel.
- Sukhoi Su-30, Mirage 2000, and MiG-29 are primarily fighter aircraft and are not the focus of this certification for blended fuel operation in the transport category.

The certification allows the AN-32 fleet to potentially utilize greener fuel options, aligning with global trends towards sustainable aviation.

83. Answer: c

Explanation:

Percentage Problem Setup

Let the unknown number be represented by the variable ' x '.

The problem states that when 106 is subtracted from this number, the result is 47% of the original number. We can express this relationship as an algebraic equation:

$$x - 106 = 0.47x$$

Solving for the Number

To find the value of ' x ', we need to solve the equation. First, gather the terms involving ' x ' on one side:

$$x - 0.47x = 106$$

Combine the ' x ' terms:

$$0.53x = 106$$

Now, isolate ' x ' by dividing both sides by 0.53:

$$x = \frac{106}{0.53}$$

$$x = 200$$

Therefore, the number is 200.

Calculating 11.5% of the Number

The final step is to calculate 11.5% of the number we found (which is 200).

To calculate this, convert the percentage to a decimal and multiply:

$$11.5\% \text{ of } 200 = 0.115 \times 200$$

Performing the multiplication:

$$0.115 \times 200 = 23$$

The result is 23.

84. Answer: c

Explanation:

Triangle Area Calculation Using Heron's Formula

This problem requires finding the area of a triangle given its three side lengths: 5 cm, 7 cm, and 11 cm. Heron's formula is used for this calculation.

Heron's Formula Explained

Heron's formula states that the area of a triangle with sides a , b , and c is:

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

where s is the semi-perimeter, calculated as $s = \frac{a+b+c}{2}$.

Step 1: Calculate the Semi-perimeter (s)

The side lengths are given as $a = 5$ cm, $b = 7$ cm, and $c = 11$ cm.

Calculate the semi-perimeter:

$$\begin{aligned} s &= \frac{5+7+11}{2} \\ s &= \frac{23}{2} \\ s &= 11.5 \text{ cm} \end{aligned}$$

Step 2: Calculate the Area using Heron's Formula

Substitute the values of s , a , b , and c into Heron's formula:

$$\begin{aligned} \text{Area} &= \sqrt{11.5 \times (11.5 - 5) \times (11.5 - 7) \times (11.5 - 11)} \\ \text{Area} &= \sqrt{11.5 \times 6.5 \times 4.5 \times 0.5} \\ \text{Area} &= \sqrt{175.9375} \\ \text{Area} &\approx 13.26 \text{ cm}^2 \end{aligned}$$

The calculation yields an area of approximately 13.26 cm^2 . Option C is 12.97 cm^2 .

85. Answer: d

Explanation:

2024 Olympic Games Host City

The host city for the **2024 Olympic Games** has been confirmed as **Paris**.

Paris secured the hosting rights for the prestigious international multi-sport event.

86. Answer: c

Explanation:

Logical Reasoning: Circular Arrangement Puzzle Solution

This solution details the step-by-step deduction to find the possible position of friend F1 in a circular arrangement puzzle.

Deducing the Seating Arrangement

1. **Analyze Constraint 3:** 'F2 is second to the left of F7'. Assume F7 is at Position 1 (P1). Moving counter-clockwise (left), Position 8 (P8) is the 1st left, and Position 7 (P7) is the 2nd left. Thus, F2 is at P7.

Initial setup (Clockwise): F7(P1), _(P2), _(P3), _(P4), _(P5), _(P6), F2(P7), _(P8)

2. **Analyze Constraint 2:** 'Only F6 is between F2 and F5'. This implies either the sequence F2-F6-F5 or F5-F6-F2 exists. With F2 at P7:

- The sequence F2-F6-F5 would place F6 at P8 and F5 at P1. This contradicts F7 being at P1.
- The sequence F5-F6-F2 implies F6 is adjacent to F2. Placing F6 at P6 makes F5 adjacent at P5. This arrangement is valid.

Updated setup (Clockwise): F7(P1), _(P2), _(P3), _(P4), F5(P5), F6(P6), F2(P7), _(P8)

3. **Analyze Constraint 4:** 'F4 is second to the right of F3'. The remaining seats are P2, P3, P4, P8. We test possible placements for F3:

- If F3 is placed at P8, moving clockwise (right): P1 is 1st right, P2 is 2nd right. This places F4 at P2. This placement is valid.

Arrangement becomes: F7(P1), F4(P2), _ (P3), _ (P4), F5(P5), F6(P6), F2(P7), F3(P8). The remaining seats P3 and P4 must be occupied by F1 and F8.

4. **Analyze Constraint 1:** 'F2 is not the neighbour of F1 or F8'. F2 is at P7. Its neighbours are P6 (occupied by F6) and P8 (occupied by F3). F1 and F8 cannot be placed in positions adjacent to P7.

The available seats for F1 and F8 are P3 and P4. Since neither P3 nor P4 is adjacent to P7, this constraint is satisfied regardless of how F1 and F8 are placed in P3 and P4.

5. **Determine F1's position relative to F6.** Let's assume a specific valid arrangement: F1 is at P3 and F8 is at P4.

Complete arrangement (Clockwise): F7(P1), F4(P2), F1(P3), F8(P4), F5(P5), F6(P6), F2(P7), F3(P8).

Now, find F1's position relative to F6 (at P6):

- Count counter-clockwise (left) from F6(P6): P5 is the 1st left, P4 is the 2nd left, P3 is the 3rd left.
- F1 is located at P3.

Therefore, F1 is 3rd to the left of F6.

Verifying Placement Options

The derived relative position of F1 (3rd to the left of F6) matches Option 3.

- Option 1: Third to the left of F5(P5). Counting left from P5: P4 (1st), P3 (2nd), P2 (3rd). F4 is at P2. Incorrect.
- Option 2: Immediate left of F4(P2). The position to the left is P1. F7 is at P1. Incorrect.

- Option 3: Third to the left of F6(P6). Counting left from P6: P5 (1st), P4 (2nd), P3 (3rd). F1 is at P3. Correct.
- Option 4: Second to the left of F7(P1). Counting left from P1: P8 (1st), P7 (2nd). F2 is at P7. Incorrect.

87. Answer: a

Explanation:

Letter Cluster Analogy: ACEG : PRTV :: SUWY : ?

This question involves a **letter cluster analogy**. We need to find the relationship between the first pair of letter clusters (**ACEG** and **PRTV**) and apply the same logic to the second pair (**SUWY** and ?) to find the missing cluster.

Identifying the Pattern

Let's examine the relationship between **ACEG** and **PRTV** by looking at the positional shift of each letter in the alphabet:

- **A** is the 1st letter. **P** is the 16th letter. The shift is $16 - 1 = 15$.
- **C** is the 3rd letter. **R** is the 18th letter. The shift is $18 - 3 = 15$.
- **E** is the 5th letter. **T** is the 20th letter. The shift is $20 - 5 = 15$.
- **G** is the 7th letter. **V** is the 22nd letter. The shift is $22 - 7 = 15$.

The pattern identified is a consistent shift of **+15** positions for each letter from the first cluster to the second.

Applying the Pattern

Now, we apply the same **+15** shift pattern to the letter cluster **SUWY**:

- **S** is the 19th letter. Adding 15: $19 + 15 = 34$. Since there are only 26 letters, we find the equivalent letter by subtracting 26: $34 - 26 = 8$. The 8th letter is **H**.

- **U** is the 21st letter. Adding 15: $21 + 15 = 36$. Subtracting 26: $36 - 26 = 10$. The 10th letter is **J**.
- **W** is the 23rd letter. Adding 15: $23 + 15 = 38$. Subtracting 26: $38 - 26 = 12$. The 12th letter is **L**.
- **Y** is the 25th letter. Adding 15: $25 + 15 = 40$. Subtracting 26: $40 - 26 = 14$. The 14th letter is **N**.

Combining these letters gives us the resulting cluster: **HJLN**.

Conclusion

Therefore, the letter cluster that completes the analogy is **HJLN**, which corresponds to Option A.

88. Answer: a

Explanation:

Arguments on Tobacco Ban Strength

This question asks to evaluate the strength of two arguments concerning a complete ban on tobacco sale and use in India.

Argument I: Health Risks (Cancer)

- **Argument:** Yes, tobacco sale and use should be banned because it causes oral cancer and other diseases.
- **Analysis:** This argument focuses on the severe public health consequences of tobacco consumption. The link between tobacco and diseases like cancer is scientifically established and represents a significant societal cost. This is a **strong** argument based on health protection.

Argument II: Employment Impact

- **Argument:** No, tobacco sale and use should not be banned because millions of workers will lose their jobs.
- **Analysis:** This argument highlights the potential economic fallout, specifically widespread job losses in the tobacco industry and related sectors. The livelihood of millions is a critical socio-economic factor to consider in policy decisions. This is a **strong** argument based on economic stability and employment.

Conclusion on Argument Strength

Both arguments present valid and significant considerations:

- Argument I addresses the crucial aspect of **public health** and the detrimental effects of tobacco.
- Argument II addresses the substantial **economic impact** and potential unemployment resulting from a ban.

Since both arguments raise important, albeit conflicting, points relevant to the policy decision of banning tobacco, they are both considered strong.

89. Answer: b

Explanation:

Stacked Boxes Arrangement

This problem requires determining the order of seven stacked boxes (S, P, L, Q, R, M, N) using given constraints.

Key Constraints and Deductions

- M and L are not top/bottom. 3 boxes between M and L. M above L. This implies M is at 6 and L is at 2. Positions (Top=7, Bottom=1): [?, M, ?, ?, ?, L, ?]

- 2 boxes between L (at 2) and N. N must be above L. N is at 5. Positions: [?, M, N, ?, ?, L, ?]
- R is immediately above S (RS pair). Fits in positions 4 and 3. Positions: [?, M, N, R, S, L, ?]
- 1 box between S (at 3) and Q. Q must be at 1 (L at 2 is between). Positions: [?, M, N, R, S, L, Q]
- The remaining box P must be at the top position (7). Final Arrangement (Top to Bottom): P, M, N, R, S, L, Q

The final arrangement from top (7) to bottom (1) is:

7: P
6: M
5: N
4: R
3: S
2: L
1: Q

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Boxes Between P and N

P is at position 7.

N is at position 5.

The box situated between positions 7 and 5 is at position 6.

Box M is at position 6.

Therefore, there is **one** box between P and N.

90. Answer: b

Explanation:

Logic Puzzle Steps: Matching Children, Colors, and Fruits

We need to determine which child likes pears based on the given clues. We can use a table to keep track of the information and deductions.

Initial Clues & Deductions

- R is in **Red** clothes and likes **Grapes**.
- S likes **Apples** and is in **Purple** clothes.
- The child in **Pink** clothes likes **Bananas**.
- T likes **Mangoes**. T is NOT in Green or Pink clothes.

Building the Association Table

Let's fill in the table with confirmed information and make deductions.

Child	Color	Fruit
P		
Q		
R	Red	Grapes
S	Purple	Apples
T		Mangoes

Further Deductions

- **T's Color:** T likes Mangoes and is not in Green or Pink. R is Red, S is Purple. The available colors are Yellow and Green. Since T is not Green or Pink, and

Red/Purple are taken, T must be in **Yellow** clothes.

- **Pink Clothes & Bananas:** We know Pink clothes = Bananas.
- **Q's Preferences:** Q dislikes Bananas and Grapes. Grapes is liked by R. Since Bananas are associated with Pink clothes, Q dislikes Bananas, meaning Q is NOT in Pink clothes.
- **P's Assignment:** Since Q is not in Pink clothes, and P is the only other remaining child besides Q, R, S, T, P must be the one in Pink clothes. Therefore, P likes Bananas.
- **Q's Fruit:** The fruits assigned are Grapes (R), Apples (S), Mangoes (T), and Bananas (P). The only remaining fruit is **Pears**. Since P, R, S, T have assigned fruits, Q must like Pears.

Final Table Summary

Child	Color	Fruit
P	Pink	Bananas
Q	Green*	Pears
R	Red	Grapes
S	Purple	Apples
T	Yellow	Mangoes

**Note: The remaining color, Green, must belong to Q as P is Pink, R is Red, S is Purple, and T is Yellow. This detail isn't strictly necessary to find who likes pears but completes the puzzle.*

Conclusion

Based on the step-by-step deduction, Q is the child who likes Pears.

91. Answer: d

Explanation:

Analyzing the Relationship

We trace the relationship described in the question step-by-step from the man's perspective:

- **Reference Point:** 'Your paternal grandfather' refers to the man's father's father.
- **First Link:** 'The only son of your paternal grandfather' must be the man's father, as he is the sole son.
- **Second Link:** 'The sister of the only son...' refers to the sister of the man's father. This is the man's paternal aunt.
- **Final Link:** 'She is the only child of...' this paternal aunt. This makes the person in the photograph the man's paternal cousin (specifically, his father's sister's daughter).

A direct interpretation of the statement points towards a paternal cousin relationship.

Connecting to the Provided Answer

The designated correct answer is Option D: Mother's Brother's Son.

Let's analyze the relationship described by Option D:

- The man's 'Mother's Brother' is his maternal uncle.
- The 'Mother's Brother's Son' is therefore the man's maternal cousin.

Option D describes a male maternal cousin, which differs from the paternal cousin derived from the question's text and the use of the pronoun 'She'. However, adhering to the provided correct answer selects Option D.

92. Answer: a

Explanation:

Identifying the Odd City Out

The question asks to identify the city that doesn't belong with the others: Kathmandu, Thimphu, Dhaka, and Karachi.

Analyzing City Status

We can differentiate these cities based on their status as national capitals:

- **Kathmandu:** Capital city of Nepal.
- **Thimphu:** Capital city of Bhutan.
- **Dhaka:** Capital city of Bangladesh.
- **Karachi:** A major city and economic hub of Pakistan, but *not* the current national capital (Islamabad is).

Conclusion

Karachi is the odd one out because, unlike Kathmandu, Thimphu, and Dhaka, it is not the current capital city of its respective country.

93. Answer: a

Explanation:

Number Pattern Logic Explained

The question presents a pattern puzzle where a symbol 'B' represents an unknown operation. We need to figure out the rule governing this operation from the two given examples and then apply it to find the result for the third expression.

Analyzing the 'B' Operation

Consider the first equation: $24 \text{ B } 6 \text{ B } 12 = 42$.

Let's test if 'B' represents simple addition:

- $24 + 6 + 12 = 30 + 12 = 42$

The sum matches the given result.

Now, let's verify this hypothesis using the second equation: $31 \text{ B } 7 \text{ B } 13 = 51$.

Applying the addition rule:

- $31 + 7 + 13 = 38 + 13 = 51$

This sum also matches the given result. Thus, the operation 'B' consistently signifies addition.

Calculating $64 \text{ B } 9 \text{ B } 4$

Using the confirmed addition rule, we calculate the value for $64 \text{ B } 9 \text{ B } 4$:

- $64 + 9 + 4$
- First, add 64 and 9: $64 + 9 = 73$
- Then, add the result to 4: $73 + 4 = 77$

The result of the expression is 77.

Conclusion

The pattern identified is that 'B' represents addition. Applying this to $64 \text{ B } 9 \text{ B } 4$ yields 77, which matches Option A.

94. Answer: b

Explanation:

Coding Pattern Analysis

The problem requires deciphering a coding pattern where specific letter combinations ('QZDH', 'PLMQ') are represented by numbers (51, 54). We need to apply this pattern to find the code for 'DNRB'.

Analyzing 'QZDH' Code

We first assign standard positional values to the letters in 'QZDH' (A=1, B=2, ... Z=26).

- Q = 17
- Z = 26
- D = 4
- H = 8

The sum of these positions is:

$$\text{Sum} = 17 + 26 + 4 + 8 = 55$$

The given code for 'QZDH' is 51. The difference between the sum and the code is $55 - 51 = 4$. Notice that 'QZDH' contains 4 letters.

Analyzing 'PLMQ' Code

Similarly, we find the positional values for 'PLMQ':

- P = 16
- L = 12
- M = 13
- Q = 17

The sum of these positions is:

$$\text{Sum} = 16 + 12 + 13 + 17 = 58$$

The given code for 'PLMQ' is 54. The difference is $58 - 54 = 4$. Again, 'PLMQ' consists of 4 letters.

Deriving the Coding Rule

From the analysis of both examples, the pattern appears to be:

Code = (Sum of positional values of letters) – (Number of letters in the word)

Calculating 'DNRB' Code

Now, we apply this rule to the word 'DNRB'.

The positional values are:

- D = 4
- N = 14
- R = 18
- B = 2

The sum of these positions is:

$$\text{Sum} = 4 + 14 + 18 + 2 = 38$$

The word 'DNRB' has 4 letters.

Using the derived rule:

$$\text{Code} = 38 - 4 = 34$$

Final Answer

The code for 'DNRB' is 34.

95. Answer: d

Explanation:

Analyzing the Letter-Number Analogy

The question presents an analogy based on letter positions in the alphabet and numerical values. We need to find the pattern connecting 'ACE' to '1925' and apply it to 'BDF'.

Pattern Identification: ACE to 1925

- Find the alphabetical position for each letter in 'ACE':
 - A = 1
 - C = 3
 - E = 5
- Square each position number:
 - $1^2 = 1$
 - $3^2 = 9$
 - $5^2 = 25$
- Concatenate (join) the squared numbers: 1, 9, 25 becomes 1925. This matches the given number.

Applying the Pattern to BDF

Use the same pattern identified above for the letter cluster 'BDF':

- Find the alphabetical position for each letter in 'BDF':
 - B = 2
 - D = 4
 - F = 6
- Square each position number:
 - $2^2 = 4$
 - $4^2 = 16$
 - $6^2 = 36$
- Concatenate the squared numbers: 4, 16, 36 becomes 41636.

Therefore, the number related to 'BDF' following the same pattern is 41636.

96. Answer: d

Explanation:

CHILD Code Language Pattern

This question involves deciphering a specific code pattern used for encoding words.

Decoding CHILD to 412983

The word **CHILD** is encoded as **412983**.

We first identify the standard alphabetical position for each letter in CHILD:

- C = 3
- H = 8
- I = 9
- L = 12
- D = 4

By comparing the letter positions (3, 8, 9, 12, 4) with the code (412983), we can identify the pattern:

1. The word is reversed: CHILD becomes DLICH.
2. Each letter in the reversed word (DLICH) is replaced by its alphabetical position number:
 - D corresponds to 4
 - L corresponds to 12
 - I corresponds to 9
 - H corresponds to 8
 - C corresponds to 3
3. These numbers are then concatenated together in order: 4, 12, 9, 8, 3 results in 412983.

The encoding rule is confirmed as: **Reverse the word, then substitute letters with their corresponding alphabetical position numbers.**

Encoding ADULT using the Pattern

We apply the same discovered pattern to encode the word **ADULT**.

1. **Reverse the word ADULT:** This gives TLUDA.
2. **Determine the alphabetical positions for each letter in TLUDA:**
 - T = 20
 - L = 12
 - U = 21
 - D = 4
 - A = 1
3. **Concatenate these position numbers in order:** Combining 20, 12, 21, 4, and 1 yields 20122141.

Final ADULT Code

Following the identified code language pattern, **ADULT** is written as **20122141**.

97. Answer: d

Explanation:

Reasoning Family Tree Structure

The question asks for the total number of children A has based on the given family relationships.

Identifying Key Relationships

- **A is the only son of D.** This is a crucial piece of information linking D and A.
- **D is the paternal grandfather of F.** This implies F's father is D's son.
- Combining the above two points: Since A is D's *only* son, and D is F's paternal grandfather, **A must be F's father.**
- **A is the father of B.** This directly tells us B is a child of A.
- From point 3, we established **A is F's father**, making **F a child of A.**
- **C is the sister of F.** Since F is A's child, C, being F's sibling, must also be **A's child.**

Counting A's Children

Based on the deductions:

- B is a child of A.
- F is a child of A.
- C is a child of A.

Therefore, A has a total of 3 children.

98. Answer: c

Explanation:

Analyze Number Series Pattern

The given number series is: 2, 4, 3, 3, 9, 6, 4, 16, ?, 5, 25, 15.

The task is to determine the value that should replace the question mark ('?') based on the underlying pattern.

Identify Series Grouping and Progression

The series can be logically divided into groups of three consecutive numbers:

- Group 1: (2, 4, 3)
- Group 2: (3, 9, 6)
- Group 3: (4, 16, ?)
- Group 4: (5, 25, 15)

Examining these groups helps reveal the pattern.

Series First Number Progression

The first number in each group progresses sequentially:

2, 3, 4, 5

This is an arithmetic progression with a common difference of 1. This confirms the first number of Group 3 is 4.

Series Second Number Pattern

Within each group, the second number is the square of the first number:

- Group 1: $2^2 = 4$
- Group 2: $3^2 = 9$
- Group 3: $4^2 = 16$
- Group 4: $5^2 = 25$

This relationship is consistent across all groups.

Series Third Number Calculation

Let the first number of a group be N and the third number be X . We analyze the relationship $X = N \times m$, where m is a multiplier.

- Group 1: $N = 2, X = 3$. Calculation: $3 = 2 \times m \implies m = 3/2 = 1.5$.
- Group 2: $N = 3, X = 6$. Calculation: $6 = 3 \times m \implies m = 6/3 = 2$.
- Group 4: $N = 5, X = 15$. Calculation: $15 = 5 \times m \implies m = 15/5 = 3$.

The sequence of multipliers (m) is 1.5, 2, ?, 3.

This sequence of multipliers forms an arithmetic progression: 1.5, 2.0, 2.5, 3.0, with a common difference of 0.5.

Determine Missing Number

For Group 3:

- The first number is $N = 4$.
- The required multiplier m is 2.5 (from the multiplier progression).

Calculate the third number X for Group 3:

$$X = N \times m = 4 \times 2.5 = 10$$

Thus, the number replacing the question mark is 10.

The full series is: 2, 4, 3, 3, 9, 6, 4, 16, 10, 5, 25, 15.

99. Answer: d

Explanation:

Understanding the Odd One Out Question

The goal is to identify which pair of numbers does not follow the same logical pattern as the others in the list: 3-6, 4-8, 6-18, 8-32, 10-50.

Analyzing Number Pair Relationships

We examine the relationship between the first number (A) and the second number (B) in each pair. Let's find the multiplier (B/A) for each pair:

- Pair 3-6: Multiplier = $6 \div 3 = 2$
- Pair 4-8: Multiplier = $8 \div 4 = 2$
- Pair 6-18: Multiplier = $18 \div 6 = 3$
- Pair 8-32: Multiplier = $32 \div 8 = 4$
- Pair 10-50: Multiplier = $50 \div 10 = 5$

Identifying the Underlying Pattern

Most of the pairs seem to follow a specific rule connecting the first number (A) to the second number (B). Let's test the rule $B = A \times (A/2)$:

- **4-8:** $4 \times (4/2) = 4 \times 2 = 8$. (Matches)
- **6-18:** $6 \times (6/2) = 6 \times 3 = 18$. (Matches)
- **8-32:** $8 \times (8/2) = 8 \times 4 = 32$. (Matches)
- **10-50:** $10 \times (10/2) = 10 \times 5 = 50$. (Matches)

This rule holds true for four out of the five pairs.

Testing the Remaining Pair

Now, let's apply the identified rule $B = A \times (A/2)$ to the pair 3-6:

- **3-6:** $3 \times (3/2) = 3 \times 1.5 = 4.5$.

The rule predicts the second number should be 4.5, but the actual second number is 6.

Conclusion: The Odd One Out

Since the pair 3-6 does not conform to the pattern $B = A \times (A/2)$ observed in the other pairs, it is the odd one out.

100. Answer: a

Explanation:

Analogy: Bed to Pillow Relationship

This question requires identifying the relationship between the first pair of words ('Bed' and 'Pillow') and applying that same relationship to find the missing word related to 'Sofa'.

Understanding the Bed-Pillow Connection

A 'Pillow' is an accessory commonly placed on a 'Bed' to provide comfort and support.

Applying the Relationship to Sofa

We need to find an item that serves a similar purpose for a 'Sofa' as a pillow does for a bed. Let's evaluate the given options:

- **Cushions:** Cushions are typically added to sofas to enhance comfort and provide support, directly matching the function of a pillow on a bed.
- **Sheets:** Sheets are primarily used for bedding on a bed and are not standard accessories for a sofa.
- **Covers:** While a sofa might have a cover, this term is too general and doesn't specifically represent an item added for comfort like a pillow.
- **Upholstery:** Upholstery refers to the material that makes up the sofa's surface; it is not an added accessory.

Conclusion

The item that best fits the analogy by serving the same function (comfort and support accessory) for a sofa as a pillow does for a bed is 'Cushions'.

Correct Answer: **Cushions**

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