Karnataka PGCET(MCA) 2021 Question Paper With Solutions

Time Allowed :3 Hours	**Maximum Marks :**60	**Total questions :**80

General Instructions

Read the following instructions very carefully and strictly follow them:

1. Please check that this question paper contains 19 printed pages.
2. Please check that this question paper contains 80 questions.
3. Q.P. Code given on the right hand side of the question paper should be written on the title page of the answer-book by the candidate.
4. Please write down the Serial Number of the question in the answer- book at the given place before attempting it.
5. 15 minute time has been allotted to read this question paper. The question paper will be distributed at 10.15 a.m. From 10.15 a.m. to 10.30 a.m., the candidates will read the question paper only and will not write any answer on the answer-book during this period.
6. This Question Paper has 80 questions. All questions are compulsory.
7. Adhere to the prescribed word limit while answering the questions.

Q1. A book titled ”Future of Higher Education – Nine Mega Trends” is authored by:

(A) V Pattabhi Ram

(B) Urjit Patel

(C) RC Bhargava

(D) M Venkaiah Naidu

Correct Answer: (A) V Pattabhi Ram

Solution:

The book ”Future of Higher Education – Nine Mega Trends” was co-authored by V Pattabhi Ram, a noted Chartered Accountant and educationist, along with other contributors.

It explores transformative trends that will shape the future of higher education, especially in the context of technology, globalisation, and new learning paradigms.

Option (B), Urjit Patel, is the former RBI Governor and is known for his work in economics, not higher education books.

Option (C), RC Bhargava, is the Chairman of Maruti Suzuki and has authored works related to the automobile industry.

Option (D), M Venkaiah Naidu, is a politician and former Vice President of India, known for speeches and political writings but not this specific book.

Therefore, the correct answer is (A) V Pattabhi Ram.

Quick Tip

Remember to associate authors with their primary domain of expertise to eliminate incorrect options quickly.

Q2. Who developed the world’s most affordable COVID-19 Diagnostic kit ”Corosure”?

(A) IIT Madras

(B) IIT Delhi

(C) IIT Kanpur

(D) AIIMS Nagpur

Correct Answer: (B) IIT Delhi

Solution:

The ”Corosure” COVID-19 diagnostic kit was developed by IIT Delhi.
It was recognised as the world’s most affordable real-time PCR-based COVID-19 testing kit, costing significantly less than similar global counterparts.
The kit received approval from the Indian Council of Medical Research (ICMR) and played a key role in expanding affordable testing during the pandemic.
Option (A), IIT Madras, has contributed to multiple healthcare innovations but was not responsible for this kit.
Option (C), IIT Kanpur, worked on ventilator technology during COVID-19 but did not create the ”Corosure” kit.
Option (D), AIIMS Nagpur, is a medical institution involved in treatment and research, but not in the development of this diagnostic kit.
Therefore, the correct answer is (B) IIT Delhi.

Quick Tip

Link major innovations to their institutions — IIT Delhi is widely known for healthcare-related technology advancements, especially during COVID-19.

Q3. Who has provided drones named ”Bharat” to the Indian Army to provide accurate surveillance along the Line of Actual Control in high altitude and mountainous terrains of Eastern Ladakh?
(A) ISRO
(B) Indian Navy
(C) DRDO
(D) US Navy
Correct Answer: (C) DRDO
Solution:
The Defence Research and Development Organisation (DRDO) developed and provided the ”Bharat” drones to the Indian Army.
These drones are specifically designed for high-altitude operations in mountainous terrains like Eastern Ladakh, where conditions are extremely challenging.

They enable accurate surveillance and reconnaissance along the Line of Actual Control (LAC), enhancing the Army's ability to monitor and respond to threats.

Option (A), ISRO, focuses on space research and satellite launches, not tactical battlefield drones.

Option (B), Indian Navy, operates in maritime defence and is not associated with providing such drones.

Option (D), US Navy, is an American military branch with no direct role in Indian Army equipment procurement.

Given the strategic defence technology expertise of DRDO, they are the correct provider of the "Bharat" drones.

Quick Tip

Link defence technology projects with DRDO, especially for indigenous surveillance and combat innovations in the Indian military.

Q4. Who has signed an MoU with the Department of MSME and Mines of Government of Karnataka to promote arts, crafts, and the handloom sector of Karnataka?

(A) Amazon

(B) Flipkart

(C) Reliance

(D) Paytm

Correct Answer: (B) Flipkart

Solution:

Flipkart, one of India's leading e-commerce companies, signed an MoU with the Department of MSME and Mines of the Government of Karnataka.

The objective of this agreement is to promote the arts, crafts, and handloom sector of the state by providing artisans and weavers access to online marketplaces.

This initiative enables small-scale producers to expand their reach beyond local markets and connect with customers nationwide.

Option (A), Amazon, also works with artisans but was not the signatory in this particular

MoU with Karnataka.

Option (C), Reliance, is involved in retail but not in this specific handloom promotion agreement.

Option (D), Paytm, is a fintech company focused on payments and commerce but not on this partnership.

Therefore, the correct answer is (B) Flipkart.

Quick Tip

When identifying MoU signatories, link the organisation's core business strengths to the purpose of the agreement — Flipkart's e-commerce platform is ideal for promoting crafts and handlooms.

Q5. First Indian woman to become Miss Universe:

(A) Reita Faria

(B) Sushmita Sen

(C) Lara Dutta

(D) Aishwarya Rai

Correct Answer: (B) Sushmita Sen

Solution:

Sushmita Sen became the first Indian woman to win the Miss Universe title in 1994.

Her victory was historic as it marked India's entry into the global beauty pageant spotlight, inspiring future participants and winners.

Option (A), Reita Faria, was the first Indian to win Miss World in 1966, but not Miss Universe.

Option (C), Lara Dutta, won Miss Universe in 2000, but she was not the first.

Option (D), Aishwarya Rai, won Miss World in 1994, the same year Sushmita Sen won Miss Universe, but in a different pageant.

Thus, the correct answer is (B) Sushmita Sen.

Quick Tip

Remember — Reita Faria was the first Miss World from India, while Sushmita Sen was the first Miss Universe from India.

Q6. The synonym of IRONIC is:

(A) Inflexible

(B) Bitter

(C) Good-natured

(D) Disguisedly sarcastic

Correct Answer: (D) Disguisedly sarcastic

Solution:

The term ”ironic” refers to expressing meaning using language that normally signifies the opposite, often for humorous or emphatic effect.

It involves a form of sarcasm or disguised mockery, making ”disguisedly sarcastic” the most accurate synonym among the given choices.

Option (A), ”Inflexible,” relates to rigidity and unwillingness to change, which is unrelated to irony.

Option (B), ”Bitter,” refers to a sharp or resentful tone but does not specifically convey the disguised or opposite-meaning element of irony.

Option (C), ”Good-natured,” is actually opposite in tone to irony, as irony often carries a mocking undertone.

Thus, option (D) matches the definition of ”ironic” best.

Quick Tip

When choosing synonyms, focus on the exact nuance of the word — irony is closely tied to sarcasm or hidden mockery.

Q7. The antonym of COMFORT is:

(A) Uncomfort

(B) Miscomfort

(C) Discomfort

(D) None of these

Correct Answer: (C) Discomfort

Solution:

The word ”comfort” means a state of physical ease, relaxation, or freedom from pain or constraint.

Its direct antonym is ”discomfort,” which means a state of slight pain, unease, or lack of comfort.

Option (A), ”Uncomfort,” is not a standard English word and is incorrect.

Option (B), ”Miscomfort,” is also not a recognized English word and does not exist in common usage.

Option (D), ”None of these,” is incorrect because a valid antonym is indeed present in the list — ”discomfort.”

Therefore, the correct answer is (C) Discomfort.

Quick Tip

For antonyms, check standard dictionaries to ensure the opposite word actually exists and is in correct usage.

Q8. Sail is to sailor as pick is to:

(A) Choose

(B) Tool

(C) Nose

(D) Picker

Correct Answer: (D) Picker

Solution:

This is an analogy question where we must identify the relationship between the first pair of words and apply it to the second pair.

A ”sail” is something that is operated or used by a ”sailor.” The relationship is that the

second word is the person who uses or operates the first word.

Similarly, a ”pick” is something that is used or operated by a ”picker.” This could refer to a tool used by someone to pick fruits, vegetables, or other items.

Option (A), ”Choose,” is an action, not a person, so it does not fit the analogy pattern.

Option (B), ”Tool,” is a category of object but does not match the person-using-object relationship.

Option (C), ”Nose,” has no direct logical connection to ”pick” in this analogy context.

Thus, the correct match is option (D) ”Picker.”

Quick Tip

For analogy questions, first identify the relationship type — object to user, cause to effect, whole to part, etc. — and apply the same relationship to find the correct answer.

Q9. Gift of the gab:

(A) Lucky

(B) A big surprise

(C) Honest person

(D) To have a talent for speaking

Correct Answer: (D) To have a talent for speaking

Solution:

The phrase ”gift of the gab” is an idiom meaning the ability to speak easily, fluently, and persuasively.

It describes someone who has a natural talent for conversation and verbal expression, often charming or convincing others through speech.

Option (A), ”Lucky,” has no relation to speaking ability.

Option (B), ”A big surprise,” does not match the idiomatic meaning of the phrase.

Option (C), ”Honest person,” is unrelated to fluency or persuasiveness in speech.

Option (D) accurately captures the meaning of the idiom, making it the correct choice.

Quick Tip

When dealing with idioms, avoid interpreting them literally — instead, focus on their figurative or established usage in language.

Q10. A place where money is coined:

(A) Mint

(B) Press

(C) Treasury

(D) Bank

Correct Answer: (A) Mint

Solution:

A mint is a facility where coins are manufactured under the authority of a government. Mints produce legal tender coins for circulation and may also produce commemorative coins for collectors.

Option (B), Press, generally refers to printing machines and is associated with publishing or printing documents, not minting coins.

Option (C), Treasury, is the department responsible for managing public revenue and finances, but it does not physically manufacture coins.

Option (D), Bank, is a financial institution for storing and managing money, not producing it.

Hence, the correct answer is (A) Mint.

Quick Tip

Mint = coin production, Treasury = money management, Bank = money storage. Distinguish roles to avoid confusion.

Q11. The circumference of the circle $x^2 + y^2 - 18x - 16y + 120 = 0$ is:

(A) 5π

(B) 10π

(C) 25π

(D) $10\pi^2$

Correct Answer: (B) 10π

Solution:

We start with the given equation:

$x^2 + y^2 - 18x - 16y + 120 = 0$

Group x-terms and y-terms:

$(x^2 - 18x) + (y^2 - 16y) + 120 = 0$

Complete the square for x:

$x^2 - 18x = x^2 - 18x + 81 - 81 = (x - 9)^2 - 81$

Complete the square for y:

$y^2 - 16y = y^2 - 16y + 64 - 64 = (y - 8)^2 - 64$

Substitute back:

$(x - 9)^2 - 81 + (y - 8)^2 - 64 + 120 = 0$

$(x - 9)^2 + (y - 8)^2 - 25 = 0$

$(x - 9)^2 + (y - 8)^2 = 25$

This is the equation of a circle with radius $r = \sqrt{25} = 5$.

Circumference = $2\pi r = 2\pi \times 5 = 10\pi$.

Quick Tip

For circle equations, completing the square is the quickest way to find the radius and thus compute circumference.

Q12. If p, q, r are in A.P., then the value of

$$\begin{vmatrix} x+4 & x+9 & x+p \\ x+5 & x+10 & x+q \\ x+6 & x+11 & x+r \end{vmatrix}$$

is:

(A) $x + 15$

(B) $x + 20$

(C) $x + p + q + r$

(D) None of these

Correct Answer: (D) None of these

Solution:

Given that p, q, r are in A.P., we have $q = \frac{p+r}{2}$.

Let's simplify the determinant:

First, notice that in each column, the x term appears in every element. We can factor x out as part of column operations, but here it appears in all terms, so it will be eliminated when we take differences.

Perform $C_1 \to C_1 - C_2$ and $C_3 \to C_3 - C_2$:

$$\begin{vmatrix} -5 & x+9 & p-9 \\ -5 & x+10 & q-10 \\ -5 & x+11 & r-11 \end{vmatrix}$$

Now, C_1 has constant entries (-5, -5, -5), making it proportional, which means the determinant will simplify using cofactor expansion.

Also, using the property of determinants, if two columns are linearly dependent, the determinant will be zero. We check for dependence: since p, q, r are in A.P., $q - 10 = \frac{p-9+r-11}{2}$, which confirms a relation between entries in C_3 and C_1, C_2.

After simplification, the determinant evaluates to 0, which means it does not match any form $x +$ constant or $x + p + q + r$.

Thus, the answer is (D) None of these.

Quick Tip

In determinant problems involving A.P., try using column/row operations to exploit arithmetic progression relations — often, it reduces to a zero determinant.

Q13. The inverse of a symmetric matrix is a:

(A) Diagonal matrix

(B) Scalar matrix

(C) Symmetric matrix

(D) Skew-symmetric matrix

Correct Answer: (C) Symmetric matrix

Solution:

If A is a symmetric matrix, then $A^T = A$.

If A is invertible, we consider $(A^{-1})^T$:

$(A^{-1})^T = (A^T)^{-1}$

Since $A^T = A$, we have $(A^{-1})^T = A^{-1}$.

This means A^{-1} is also symmetric.

Option (A), Diagonal matrix, is symmetric but not all symmetric matrices are diagonal.

Option (B), Scalar matrix, is a special diagonal matrix but is too restrictive.

Option (D), Skew-symmetric matrix, has $A^T = -A$ and cannot be the inverse of a symmetric matrix in general unless it's the zero matrix, which is not invertible.

Therefore, the correct answer is (C) Symmetric matrix.

Quick Tip

Symmetry is preserved under inversion for invertible symmetric matrices. Remember the identity $(A^{-1})^T = (A^T)^{-1}$.

Q14. If

$$\begin{bmatrix} x+y+z \\ x+y \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$$

then the value of (x, y, z) is:

(A) (4, 3, 2)

(B) (3, 2, 4)

(C) (2, 3, 4)

(D) (4, 2, 3)

Correct Answer: (C) (2, 3, 4)

Solution:

We are given the equations:

1) $x + y + z = 9$

2) $x + y = 5$

3) $y + z = 7$

From equation (2), $x + y = 5$.

From equation (1), subtract equation (2):

$(x + y + z) - (x + y) = 9 - 5$

$z = 4$

From equation (3), $y + z = 7$, substituting $z = 4$:

$y + 4 = 7 \Rightarrow y = 3$

From equation (2), $x + y = 5 \Rightarrow x + 3 = 5 \Rightarrow x = 2$

Thus, $(x, y, z) = (2, 3, 4)$.

Quick Tip

For systems with three variables, use substitution and elimination step-by-step to avoid confusion.

Q15. If the angle between two lines is $\frac{\pi}{4}$ and slope of one of the lines is $\frac{1}{2}$, then the slope of the other line is:

(A) -2

(B) $-\frac{1}{2}$

(C) 1

(D) 3

Correct Answer: (D) 3

Solution:

Let slopes of the two lines be $m_1 = \frac{1}{2}$ and m_2.

The formula for the angle θ between two lines is:

$$\tan\theta = \left| \frac{m_2 - m_1}{1 + m_1 m_2} \right|$$

Here, $\theta = \frac{\pi}{4}$, so $\tan\theta = 1$.

Thus:

$$1 = \left| \frac{m_2 - \frac{1}{2}}{1 + \frac{1}{2}m_2} \right|$$

Case 1: Positive ratio:

$$\frac{m_2 - \frac{1}{2}}{1 + \frac{1}{2}m_2} = 1$$

Multiply through by the denominator:

$m_2 - \frac{1}{2} = 1 + \frac{1}{2}m_2$

$m_2 - \frac{1}{2}m_2 = 1 + \frac{1}{2}$

$\frac{1}{2}m_2 = \frac{3}{2} \Rightarrow m_2 = 3$

Case 2: Negative ratio leads to $m_2 = -\frac{1}{3}$, which would give a different angle.

Thus, the slope of the other line is 3.

Quick Tip

Always check both positive and negative cases when using the formula for angle between lines, but choose the one matching the given angle's orientation.

Q16. The value of $\cos 1^\circ \cdot \cos 2^\circ \cdot \cos 3^\circ \cdots \cos 180^\circ$ is:

(A) $\frac{1}{\sqrt{2}}$

(B) 0

(C) 1

(D) -1

Correct Answer: (B) 0

Solution:

The product includes $\cos 90^\circ$ as one of its terms.

Since $\cos 90^\circ = 0$, multiplying any number by zero results in zero.

Thus, without computing the rest of the terms, we can conclude that the entire product is 0.

Therefore, the correct answer is (B) 0.

Quick Tip

In product sequences, always check if any term is zero — it instantly determines the entire product.

Q17. If $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$ then the value of $\theta + \phi$ is:

(A) $\frac{\pi}{6}$

(B) π

(C) 0

(D) $\frac{\pi}{4}$

Correct Answer: (D) $\frac{\pi}{4}$

Solution:

We use the tangent addition formula:

$$\tan(\theta + \phi) = \frac{\tan\theta + \tan\phi}{1 - \tan\theta \cdot \tan\phi}$$

Substitute $\tan\theta = \frac{1}{2}$ and $\tan\phi = \frac{1}{3}$:

$$\tan(\theta + \phi) = \frac{\frac{1}{2} + \frac{1}{3}}{1 - \frac{1}{2} \cdot \frac{1}{3}}$$

Simplify numerator: $\frac{1}{2} + \frac{1}{3} = \frac{3+2}{6} = \frac{5}{6}$

Simplify denominator: $1 - \frac{1}{6} = \frac{5}{6}$

Thus: $\tan(\theta + \phi) = \frac{\frac{5}{6}}{\frac{5}{6}} = 1$

Since $\tan(\theta + \phi) = 1$, $\theta + \phi = \frac{\pi}{4}$ (principal value).

Hence, the correct answer is (D) $\frac{\pi}{4}$.

Quick Tip

When using the tangent addition formula, always simplify the numerator and denominator separately before dividing to avoid mistakes.

Q18. If $2\tan^{-1}(\cos x) = \tan^{-1}(2\csc x)$ then the value of x is:

(A) $\frac{3\pi}{4}$

(B) $\frac{\pi}{3}$

(C) $\frac{\pi}{4}$

(D) $\frac{\pi}{2}$

Correct Answer: (C) $\frac{\pi}{4}$

Solution:

We start from the given equation:

$$2\tan^{-1}(\cos x) = \tan^{-1}(2\csc x)$$

First, recall the double-angle identity for inverse tangent:

$$2\tan^{-1} u = \tan^{-1}\left(\frac{2u}{1-u^2}\right), \quad \text{provided } u \neq \pm 1$$

Here, $u = \cos x$.

Thus, the LHS becomes:

$$\tan^{-1}\left(\frac{2\cos x}{1-\cos^2 x}\right)$$

Since $1 - \cos^2 x = \sin^2 x$, we have:

$$\frac{2\cos x}{1-\cos^2 x} = \frac{2\cos x}{\sin^2 x}$$

Also, $\csc x = \frac{1}{\sin x}$, so $2\csc x = \frac{2}{\sin x}$.

Therefore, the equation becomes:

$$\tan^{-1}\left(\frac{2\cos x}{\sin^2 x}\right) = \tan^{-1}\left(\frac{2}{\sin x}\right)$$

Since $\tan^{-1} A = \tan^{-1} B$ implies $A = B$ (within principal branch considerations), we equate:

$$\frac{2\cos x}{\sin^2 x} = \frac{2}{\sin x}$$

Cancel 2 from both sides:

$$\frac{\cos x}{\sin^2 x} = \frac{1}{\sin x}$$

Multiply both sides by $\sin^2 x$:

$$\cos x = \sin x$$

This gives $\tan x = 1 \Rightarrow x = \frac{\pi}{4} + n\pi$, where n is an integer.

Considering principal values and the domain of the inverse tangent expressions, we choose $x = \frac{\pi}{4}$.

Quick Tip

When solving inverse trigonometric equations with multiples of $\tan^{-1}$, use the double-angle identity to simplify before equating expressions.

Q19. The value of $\cos\left(\frac{1}{2}\cos^{-1}\frac{1}{8}\right)$ is:

(A) $\frac{3}{4}$

(B) $-\frac{3}{4}$

(C) $\frac{1}{16}$

(D) $\frac{1}{4}$

Correct Answer: (A) $\frac{3}{4}$

Solution:

Let $\theta = \cos^{-1}\frac{1}{8}$. Then $\cos\theta = \frac{1}{8}$.

We need $\cos\frac{\theta}{2}$. Recall the half-angle formula:

$$\cos\frac{\theta}{2} = \sqrt{\frac{1+\cos\theta}{2}}$$

Since $0 \le \theta \le \pi$, $\cos\frac{\theta}{2} > 0$, so we take the positive root.

Substitute $\cos\theta = \frac{1}{8}$:

$$\cos\frac{\theta}{2} = \sqrt{\frac{1+\frac{1}{8}}{2}}$$

Simplify:

$$1 + \frac{1}{8} = \frac{9}{8}$$

So:

$$\cos\frac{\theta}{2} = \sqrt{\frac{\frac{9}{8}}{2}} = \sqrt{\frac{9}{16}} = \frac{3}{4}$$

Thus, the value is $\frac{3}{4}$.

Quick Tip

For half-angle problems involving inverse cosine, always ensure the sign of the result matches the quadrant of the half-angle.

Q20. In how many ways can we form a garland using 6 different flowers?

(A) 720

(B) 120

(C) 60

(D) 6

Correct Answer: (C) 60

Solution:

Arranging objects in a garland (or necklace) is different from a simple permutation because:

1) Rotations of the arrangement are considered identical.

2) Reflections (flipping) are also considered identical.

The formula for the number of distinct arrangements of n distinct items in a garland is:

$$\frac{(n-1)!}{2}$$

Here, $n = 6$.

So:

$$\frac{(6-1)!}{2} = \frac{5!}{2} = \frac{120}{2} = 60$$

Thus, there are 60 distinct garland arrangements possible.

Option (A), 720, is $6!$, which counts all permutations without accounting for rotation and reflection equivalence.

Option (B), 120, is $5!$, which accounts for rotation but not reflection.

Option (D), 6, is far too small, as it ignores most permutations.

Hence, the correct answer is 60.

Quick Tip

In circular arrangements, use $(n-1)!$ for rotations; for garlands, divide further by 2 to account for reflections.

Q21. If the probability of rain on any given day in city X is 50%, what is the probability that it rains on exactly 3 days in a 5-day period?

(A) $\frac{8}{125}$

(B) $\frac{2}{25}$

(C) $\frac{5}{16}$

(D) $\frac{8}{25}$

Correct Answer: (C) $\frac{5}{16}$

Solution:

We have $n = 5$ days, and probability of rain on any day is $p = 0.5$, probability of no rain is $q = 0.5$.

We need the probability of exactly $k = 3$ rainy days. This follows a binomial distribution:

$$P(X = k) = \binom{n}{k} p^k q^{n-k}$$

Substitute values:

$$P(X = 3) = \binom{5}{3} (0.5)^3 (0.5)^2$$

$\binom{5}{3} = 10$, and $(0.5)^5 = \frac{1}{32}$.

Thus:

$$P(X = 3) = 10 \times \frac{1}{32} = \frac{10}{32} = \frac{5}{16}$$

Hence, the probability is $\frac{5}{16}$.

Quick Tip

For "exactly k successes" problems, always use the binomial probability formula and remember $p + q = 1$.

Q22. A small company employs 3 men and 5 women. If a team of 4 employees is to be randomly selected to organize the company retreat, what is the probability that the team will have exactly 2 women?

(A) $\frac{1}{14}$

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

(C) $\frac{2}{7}$

(D) $\frac{3}{7}$

Correct Answer: (D) $\frac{3}{7}$

Solution:

Total employees = 3 men + 5 women = 8.

We select 4 employees, with exactly 2 women.

Number of ways to choose 2 women from 5: $\binom{5}{2} = 10$.

Number of ways to choose 2 men from 3: $\binom{3}{2} = 3$.

Thus, number of favorable ways: $10 \times 3 = 30$.

Total number of ways to choose any 4 employees from 8: $\binom{8}{4} = 70$.

Probability:

$$P = \frac{\text{Favorable outcomes}}{\text{Total outcomes}} = \frac{30}{70} = \frac{3}{7}$$

Thus, the probability is $\frac{3}{7}$.

Quick Tip

When a question specifies "exactly" some category counts, multiply the combinations for each category rather than using permutations.

Q23. If $\log_a(ab) = x$ then the value of $\log_b(ab)$ is:

(A) $\frac{x}{x+1}$

(B) $\frac{x}{x-1}$

(C) $\frac{x}{1-x}$

(D) $\frac{1}{x}$

Correct Answer: (B) $\frac{x}{x-1}$

Solution:

Given: $\log_a(ab) = x$.

Using log properties: $\log_a(ab) = \log_a a + \log_a b = 1 + \log_a b$.

So: $1 + \log_a b = x \Rightarrow \log_a b = x - 1$.

We want $\log_b(ab)$:

$\log_b(ab) = \log_b a + \log_b b = \log_b a + 1$.

From $\log_a b = x - 1$, we have $\log_b a = \frac{1}{\log_a b} = \frac{1}{x-1}$.

Thus: $\log_b(ab) = \frac{1}{x-1} + 1 = \frac{1+(x-1)}{x-1} = \frac{x}{x-1}$.

Hence, the correct answer is $\frac{x}{x-1}$.

Quick Tip

Use base-change relationships: $\log_a b = \frac{1}{\log_b a}$, and break down products using $\log(ab) = \log a + \log b$.

Q24. The length of the transverse axis of the hyperbola $3x^2 - 4y^2 = 32$ is:

(A) $\frac{3}{32}$

(B) $\frac{64}{3}$

(C) $\frac{8\sqrt{2}}{\sqrt{3}}$

(D) $\frac{16\sqrt{2}}{\sqrt{3}}$

Correct Answer: (C) $\frac{8\sqrt{2}}{\sqrt{3}}$

Solution:

We are given the equation of the hyperbola:

$$3x^2 - 4y^2 = 32$$

To put it into standard form, divide through by 32:

$$\frac{3x^2}{32} - \frac{4y^2}{32} = 1$$

Simplify each term:

$$\frac{x^2}{\frac{32}{3}} - \frac{y^2}{8} = 1$$

The standard form of a hyperbola with a horizontal transverse axis is:

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

Comparing, we see $a^2 = \frac{32}{3}$.

Thus:

$$a = \sqrt{\frac{32}{3}} = \frac{\sqrt{32}}{\sqrt{3}} = \frac{4\sqrt{2}}{\sqrt{3}}$$

The length of the transverse axis is $2a$:

$$2a = 2 \times \frac{4\sqrt{2}}{\sqrt{3}} = \frac{8\sqrt{2}}{\sqrt{3}}$$

Therefore, the correct answer is $\frac{8\sqrt{2}}{\sqrt{3}}$.

Quick Tip

Always rewrite the equation of a conic in standard form before identifying parameters like a, b, and c. For hyperbolas, the transverse axis length is $2a$.

Q25. If eccentricity $e = \frac{1}{3}$, then the ratio of the major axis to the minor axis of the ellipse is:

(A) $3 : 2\sqrt{2}$

(B) $9 : 8$

(C) $2\sqrt{2} : 3$

(D) $8 : 9$

Correct Answer: (A) $3 : 2\sqrt{2}$

Solution:

For an ellipse, the eccentricity is given by:

$$e = \frac{c}{a}$$

where a is the semi-major axis and c is the distance from the center to the focus.

We are given $e = \frac{1}{3}$, so:

$$\frac{c}{a} = \frac{1}{3} \quad \Rightarrow \quad c = \frac{a}{3}$$

We know that for an ellipse:

$$b^2 = a^2 - c^2$$

Substitute $c = \frac{a}{3}$:

$$b^2 = a^2 - \frac{a^2}{9} = a^2\left(1 - \frac{1}{9}\right) = a^2 \cdot \frac{8}{9}$$

Thus:

$$b = \frac{2\sqrt{2}}{3}a$$

The major axis length = $2a$, and the minor axis length = $2b = 2 \cdot \frac{2\sqrt{2}}{3}a = \frac{4\sqrt{2}}{3}a$.

The ratio of major to minor axis:

$$\frac{2a}{\frac{4\sqrt{2}}{3}a} = \frac{2}{\frac{4\sqrt{2}}{3}} = \frac{2 \cdot 3}{4\sqrt{2}} = \frac{3}{2\sqrt{2}}$$

So the ratio is $3 : 2\sqrt{2}$.

Quick Tip

For ellipse ratios, start with $e = \frac{c}{a}$ and use $b^2 = a^2 - c^2$ to relate axes lengths.

Q26. Focus of the parabola $y^2 - 8x - 32 = 0$ is:

(A) (2, 0)

(B) (-2, 0)

(C) (0, 2)

(D) (4, 0)

Correct Answer: (B) (-2, 0)

Solution:

We have:

$$y^2 - 8x - 32 = 0$$

Rewrite:

$$y^2 = 8x + 32$$

Factor out 8 from the right-hand side:

$$y^2 = 8(x + 4)$$

This is of the form $y^2 = 4a(x - h)$ with vertex at $(-4, 0)$ and $4a = 8 \Rightarrow a = 2$.

Since the parabola opens to the right, the focus is at $(h + a, k) = (-4 + 2, 0) = (-2, 0)$.

Quick Tip

Always rewrite the parabola equation in standard form to quickly identify the vertex and focal length a.

Q27. A frequency distribution can be presented graphically by a:

(A) Pie diagram

(B) Histogram

(C) Pictogram

(D) Cartogram

Correct Answer: (B) Histogram

Solution:

A histogram is a type of bar graph used to represent frequency distributions for continuous or grouped data.

In a histogram, adjacent rectangles represent class intervals, and their heights represent frequencies.

Option (A), pie diagrams, represent proportionate parts of a whole but are not specifically for continuous frequency distributions.

Option (C), pictograms, use pictures or symbols to represent quantities but are less precise.

Option (D), cartograms, are maps in which geographic regions are scaled according to a variable, not used for standard frequency distribution plots.

Thus, histograms are the correct choice for representing frequency distributions graphically.

Quick Tip

For numerical frequency data, especially continuous data, always choose a histogram for the clearest representation.

Q28. If the coefficient of variation and mean of a frequency distribution are 5% and 125 respectively, then the standard deviation is:

(A) 0.625

(B) 6.25

(C) 62.5

(D) 625

Correct Answer: (B) 6.25

Solution:

We are given:

Coefficient of Variation (CV) = $5\% = 5/100 = 0.05$

Mean $(\bar{x}) = 125$

Formula for coefficient of variation:

$$CV = \frac{\sigma}{\bar{x}}$$

where σ = standard deviation.

Substituting the given values:

$$0.05 = \frac{\sigma}{125}$$

Multiplying both sides by 125:

$$\sigma = 0.05 \times 125$$

$$\sigma = 6.25$$

Thus, the standard deviation is $\mathbf{6.25}$.

Quick Tip

Remember: Coefficient of Variation (CV) is the ratio of the standard deviation to the mean, expressed as a percentage. Always convert percentage to decimal before calculation.

Q29. The 3 arithmetic means between 3 and 19 are:

(A) 7, 11, 15

(B) 5, 10, 15

(C) 5, 7, 9

(D) 6, 11, 16

Correct Answer: (A) 7, 11, 15

Solution:

We are given two numbers: $a_1 = 3$ and $a_5 = 19$.

We need to insert 3 arithmetic means between them, which means the sequence will have 5 terms in total:

$$3,\ A_1,\ A_2,\ A_3,\ 19$$

Since it is an arithmetic progression (AP), the common difference d is given by:

$$d = \frac{\text{last term} - \text{first term}}{\text{number of terms} - 1}$$

Substituting:

$$d = \frac{19 - 3}{5 - 1} = \frac{16}{4} = 4$$

Thus, the AP is:

First term = 3

Second term = $3 + 4 = 7$

Third term = $7 + 4 = 11$

Fourth term = $11 + 4 = 15$

Fifth term = $15 + 4 = 19$

Therefore, the 3 arithmetic means are $\mathbf{7}, \mathbf{11}, \mathbf{15}$.

Quick Tip

Inserting n arithmetic means between two numbers creates an AP with $(n + 2)$ total terms. Use the common difference formula $d = \frac{\text{last}-\text{first}}{\text{total terms}-1}$ to solve quickly.

Q30. If $a^x = b^y = c^z$ and $b^2 = ac$, then the value of y is equal to:

(A) $\frac{xz}{x+z}$

(B) $\frac{2xz}{x+z}$

(C) $\frac{xz}{2(x-z)}$

(D) $\frac{xz}{2(z-x)}$

Correct Answer: (B) $\frac{2xz}{x+z}$

Solution:

We are given:

$$a^x = b^y = c^z = k \quad \text{(let the common value be } k\text{)}$$

From $a^x = k$ we get $a = k^{1/x}$

From $b^y = k$ we get $b = k^{1/y}$

From $c^z = k$ we get $c = k^{1/z}$

Also, $b^2 = ac$ is given. Substituting these values:

$$\left(k^{1/y}\right)^2 = k^{1/x} \cdot k^{1/z}$$

Simplifying the left-hand side:

$$k^{2/y} = k^{1/x+1/z}$$

Since bases are the same, equate exponents:

$$\frac{2}{y} = \frac{1}{x} + \frac{1}{z}$$

Taking LCM:

$$\frac{2}{y} = \frac{z+x}{xz}$$

Inverting:

$$y = \frac{2xz}{x+z}$$

Thus, $\mathbf{y = \frac{2xz}{x+z}}$.

Quick Tip

When $a^x = b^y = c^z$, substitute each variable in terms of a common base and exponent to simplify the comparison.

Q31. Structured programming languages such as C, COBOL, and FORTRAN were used in which of the following computers?

(A) First Generation Computers

(B) Second Generation Computers

(C) Third Generation Computers

(D) Fourth Generation Computers

Correct Answer: (C) Third Generation Computers

Solution:

Third Generation Computers were introduced around the mid-1960s to early 1970s.

They used Integrated Circuits (ICs) instead of transistors, leading to smaller, faster, and more reliable machines.

During this period, structured programming languages such as C, COBOL, and FORTRAN became popular for developing applications and performing complex computational tasks.

- First Generation Computers used machine language and vacuum tubes.

- Second Generation Computers used transistors and assembly language, with early high-level languages beginning to emerge.

- Third Generation Computers saw the standardization of structured programming languages, making them the correct answer here.
- Fourth Generation Computers later focused on microprocessors and further user-friendly programming environments.
Therefore, the correct generation is **Third Generation Computers**.

Quick Tip

Match the evolution of computer hardware with programming language development — ICs and structured programming align with third generation.

Q32. Modern computers follow a generalised set of instructions to perform any function. What are these instructions better known as?
(A) Language
(B) Instructions
(C) Commands
(D) Programs
Correct Answer: (D) Programs
Solution:
A computer requires a defined set of steps to perform any task.
These steps are written in a specific order and format so that the computer can process them. When these instructions are compiled together in a logical sequence, they form what is known as a **program**.
- Option (A) "Language" refers to the medium of writing instructions, such as Python, C, or Java, but the question asks for the name of the *set* of instructions itself.
- Option (B) "Instructions" are the individual steps, but the complete set of them is called a program.
- Option (C) "Commands" are specific directives given to the computer, but they do not necessarily constitute an entire program.
- Option (D) "Programs" correctly describes the set of instructions used to perform a task, making this the correct answer.

Hence, the answer is **Programs**.

Quick Tip

A language is the medium, instructions are steps, but a program is the complete set of instructions to achieve a specific task.

Q33. Which of the following is not an input device of the computer?

(A) Trackball

(B) Image Scanner

(C) Joystick

(D) Sound Card

Correct Answer: (D) Sound Card

Solution:

An input device is hardware used to send data to a computer, allowing the user to interact with and control it.

Examples include keyboards, mice, scanners, and joysticks.

- Option (A) Trackball: An input device that allows cursor control — **input**.

- Option (B) Image Scanner: Used to convert physical documents into digital form — **input**.

- Option (C) Joystick: Used for gaming and simulation control — **input**.

- Option (D) Sound Card: This is actually an **output** (and processing) device related to audio. It processes audio signals and sends them to speakers or headphones. While some sound cards may have audio input ports, their primary role is not as an input device for control or data entry.

Thus, **Sound Card** is the correct choice for "not an input device."

Quick Tip

Always distinguish between input devices (send data to computer) and output devices (send data from computer to the user).

Q34. Which of the following are being managed by a database management system?

(A) Data

(B) Database Engine

(C) Database Schema

(D) All of the Above

Correct Answer: (D) All of the Above

Solution:

A Database Management System (DBMS) is software that stores, retrieves, and manages data in databases.

It performs multiple functions, and among them are:

1. **Data:** DBMS stores and manages actual data that users query and update.

2. **Database Engine:** The DBMS uses a database engine to process queries and transactions efficiently.

3. **Database Schema:** The schema defines the structure and organization of data — tables, fields, and relationships — which is also maintained by the DBMS.

Since a DBMS is responsible for all three — Data, Engine, and Schema — the correct answer is **All of the Above**.

Quick Tip

DBMS not only stores data but also manages how it's organized and accessed via the database engine and schema.

Q35. The system unit of a personal computer typically contains which of the following?

(A) Microprocessor

(B) Disc Controller

(C) Serial Interface

(D) All of the Above

Correct Answer: (D) All of the Above

Solution:

The **system unit** is the main body of a personal computer that houses critical components needed for computing tasks.

It typically contains:

1. **Microprocessor (CPU):** The brain of the computer, executing instructions and processing data.

2. **Disc Controller:** Manages the reading and writing of data to and from storage devices such as HDDs, SSDs, or optical drives.

3. **Serial Interface:** Allows communication between the computer and external devices via serial ports.

Since all these components are typically part of the system unit, the correct choice is **All of the Above**.

Quick Tip

The system unit houses the CPU, controllers, interfaces, and other essential internal hardware — everything except peripherals like the monitor or keyboard.

Q36. The most common method of entering text and numerical data into a computer system is through the use of which of the following?

(A) Plotter

(B) Scanner

(C) Printer

(D) Keyboard

Correct Answer: (D) Keyboard

Solution:

A **keyboard** is the most widely used input device for entering both text and numerical data into a computer.

- Option (A) Plotter: An output device used for printing large-scale drawings or graphics.

- Option (B) Scanner: An input device but mainly used for digitizing images or documents, not for entering continuous text or numeric data.

- Option (C) Printer: An output device used to produce physical copies of digital documents.

- Option (D) Keyboard: The primary input device for typing and numeric entry, making it the most common choice for such tasks.

Thus, **Keyboard** is correct.

Quick Tip

When the question is about "most common" text or number entry method, the answer is almost always "keyboard" in computer basics.

Q37. Which of the following is not a bitwise operator?

(A) |

(B) ^

(C) .

(D) <<

Correct Answer: (C) .

Solution:

Bitwise operators work at the binary level, operating directly on bits of integers.

Common bitwise operators include:

- | (Bitwise OR)

- ^ (Bitwise XOR)

- & (Bitwise AND)

- << (Left shift) and >> (Right shift)

The . operator, however, is not a bitwise operator — in many programming languages it is used as a **member access** or concatenation operator (e.g., accessing object properties or joining strings).

Thus, . is the correct answer.

Quick Tip

Bitwise operators modify individual bits; if the symbol is used for object access or string concatenation, it's not bitwise.

Q38. The sign magnitude representation of -1 is:

(A) 0001

(B) 1110

(C) 1000

(D) 1001

Correct Answer: (D) 1001

Solution:

In sign magnitude representation for a 4-bit binary number:

- The **first bit** (most significant bit) represents the sign: `0` for positive, `1` for negative.

- The remaining bits represent the magnitude (absolute value) of the number.

For -1:

- Sign bit = 1 (negative)

- Magnitude = binary of 1 = `001` (3 bits)

Combining: Sign bit (1) + Magnitude (001) = `1001`

Thus, the sign magnitude representation of -1 is **1001**.

Quick Tip

Sign magnitude form: First bit = sign, remaining bits = magnitude. Positive = 0, Negative = 1.

Q39. Software which allows the user to view the webpage is called:

(A) Interpreter

(B) Operating system

(C) Internet Browser

(D) Website

Correct Answer: (C) Internet Browser

Solution:

An **Internet Browser** (also called a web browser) is a software application that enables users to access, retrieve, and view information on the World Wide Web.

Examples include Google Chrome, Mozilla Firefox, Microsoft Edge, and Safari.

- Option (A) Interpreter: Translates programming code into machine language for execution — unrelated to viewing web pages.

- Option (B) Operating System: Manages computer hardware and software resources — not

specifically for viewing web content.

- Option (C) Internet Browser: Correct, as it is the software designed to open and display web pages using HTTP/HTTPS protocols.

- Option (D) Website: A collection of related web pages, not the software to view them.

Thus, the answer is **Internet Browser**.

Quick Tip

Browsers are the gateway to the web — they interpret HTML, CSS, and scripts to present web content to users.

Q40. A program that automatically connects to websites and downloads documents, saving them to the local drive, is known as:

(A) Offline browsers

(B) Web servers

(C) Web downloading utilities

(D) None of these

Correct Answer: (C) Web downloading utilities

Solution:

Web downloading utilities are specialized programs or tools that can automatically connect to websites and retrieve files or entire web pages to be stored locally.

They often provide features like scheduling downloads, resuming broken transfers, and downloading multiple files at once.

- Option (A) Offline browsers: Used to save entire websites for offline viewing but not necessarily designed for automatic, repeated downloading.

- Option (B) Web servers: Host websites and serve web pages to browsers — they do not download content to a user's system.

- Option (C) Web downloading utilities: Correct, as they automate the process of downloading files or pages from the internet to the local computer.

- Option (D) None of these: Incorrect, since option (C) is valid.

Therefore, the correct choice is **Web downloading utilities**.

Quick Tip

Use web downloading utilities for automating bulk downloads — examples include wget, Internet Download Manager (IDM), and JDownloader.

Q41. How many bytes are there in 1011 1001 0110 1110 numbers?

(A) 1

(B) 2

(C) 4

(D) 8

Correct Answer: (B) 2

Solution:

A **byte** is defined as a group of 8 bits (binary digits).

The given binary number is:

$$1011\ 1001\ 0110\ 1110$$

First, count the total number of bits:

Each group shown here has 4 bits (because of the spacing).

There are 4 groups: $4 \times 4 = 16$ bits in total.

Now, divide the total bits by 8 (since 1 byte = 8 bits):

$$\frac{16 \text{ bits}}{8 \text{ bits per byte}} = 2 \text{ bytes}$$

Therefore, the binary number given contains **2 bytes**.

This means the binary string can be stored in exactly two memory locations of size 1 byte each.

Quick Tip

Always remember: 1 byte = 8 bits. To find bytes, divide total bits by 8. Binary numbers are often grouped into 4 bits (nibbles) for readability.

Q42. The binary equivalent of the octal number 13.54 is:

(A) 1011.1011

(B) 1001.1110

(C) 1101.1110

(D) None of these

Correct Answer: (A) 1011.1011

Solution:

We are given the octal number 13.54 and must convert it to binary.

Recall: **Each octal digit can be directly converted to 3 binary bits** because $8 = 2^3$.

Step 1: Separate the integer and fractional parts.

Integer part: $13_{(8)}$ Fractional part: $54_{(8)}$

Step 2: Convert integer part:

$1_{(8)} = 001_{(2)}$

$3_{(8)} = 011_{(2)}$

So $13_{(8)} = 001\ 011_{(2)}$ (we can remove leading zeros): $1011_{(2)}$

Step 3: Convert fractional part:

$5_{(8)} = 101_{(2)}$

$4_{(8)} = 100_{(2)}$

So $54_{(8)} = 101\ 100_{(2)}$

Step 4: Combine:

$13.54_{(8)} = 1011.101100_{(2)}$

If we are keeping the same number of octal fractional digits represented in binary (each exact conversion), we can stop here.

Rounding to match options: $1011.1011_{(2)}$ is the closest correct representation.

Quick Tip

Convert each octal digit to exactly 3 binary bits. For fractions, keep the order and precision as per the original octal digits.

Q43. What else is a command interpreter called?

(A) prompt

(B) kernel

(C) shell

(D) command

Correct Answer: (C) shell

Solution:

A **command interpreter** is a part of an operating system that takes user commands, interprets them, and passes them to the system for execution.

This component is commonly known as the **shell**.

- The shell provides a user interface — either command-line-based (CLI) or graphical (GUI) — to interact with the OS.

- In Unix/Linux systems, examples of shells are Bash, Zsh, and Ksh. In Windows, Command Prompt and PowerShell serve similar purposes.

- Option (A) "prompt" refers to the symbol displayed to indicate readiness for user input, not the interpreter itself.

- Option (B) "kernel" is the core of the OS that manages resources, but it doesn't directly interpret user commands.

- Option (D) "command" is generic and refers to an instruction, not the interpreter.

Therefore, the correct answer is **shell**.

Quick Tip

Remember: The kernel manages resources; the shell interprets user commands and communicates with the kernel.

Q44. BIOS is used:

(A) By operating system

(B) By compiler

(C) By interpreter

(D) By application software

Correct Answer: (A) By operating system

Solution:

BIOS stands for **Basic Input/Output System**.

It is firmware stored in a computer's ROM (Read-Only Memory) chip on the motherboard. When a computer is powered on, the BIOS performs the POST (Power-On Self Test) to check hardware functionality.

After POST, BIOS loads the bootloader and helps the operating system start by providing low-level communication between the OS and hardware components.

- Option (A) is correct because the BIOS acts as an interface for the operating system to access hardware resources at startup.
- Option (B) Compiler: This is a software tool for converting source code into machine code — unrelated to BIOS functions.
- Option (C) Interpreter: Translates code line-by-line during execution — not a BIOS task.
- Option (D) Application Software: User-level programs like browsers or word processors — BIOS operates at a much lower level.

Therefore, the correct answer is **By operating system**.

Quick Tip

BIOS is the first code that runs when you power on the computer, bridging hardware and the OS.

Q45. What do you mean by one-to-many relationships?

(A) One class may have many teachers

(B) One teacher can have many classes

(C) Many classes may have many teachers

(D) Many teachers may have many classes

Correct Answer: (B) One teacher can have many classes

Solution:

In database and relationship modeling, a **one-to-many relationship** means that a single entity in one table is associated with multiple entities in another table.

For example: In a school database, one **Teacher** may teach multiple **Classes**.

Here:

- The ”one” side is the Teacher.
- The ”many” side is the Classes.

- Each teacher's ID can appear multiple times in the classes table.

Examining the options:

- Option (A) is incorrect because "one class may have many teachers" describes a many-to-many relationship.

- Option (B) correctly reflects one-to-many, where one teacher teaches multiple classes.

- Option (C) "many classes may have many teachers" is many-to-many.

- Option (D) "many teachers may have many classes" is also many-to-many.

Hence, the correct choice is **One teacher can have many classes.**

Quick Tip

One-to-many means a single record is linked to multiple records in another table — common in relational databases.

Q46. If in a certain language CARROM is coded as BZQQNL, which word will be coded as HORSE?

(A) IPSTF

(B) GNQRD

(C) FTSPI

(D) DRQNG

Correct Answer: (A) IPSTF

Solution:

We are told: CARROM $\rightarrow$ BZQQNL.

Step 1: Compare letter by letter:

C $\rightarrow$ B: Shift -1 in alphabet.

A $\rightarrow$ Z: Shift -1 (wraps around).

R $\rightarrow$ Q: Shift -1.

R $\rightarrow$ Q: Shift -1.

O $\rightarrow$ N: Shift -1.

M $\rightarrow$ L: Shift -1.

So the code rule is: Each letter is shifted **one position back** in the alphabet.

Step 2: Apply the same rule to HORSE:

H → G (back 1)

O → N (back 1)

R → Q (back 1)

S → R (back 1)

E → D (back 1)

This gives: GNQRD.

However, the answer key says (A) IPSTF, so let's recheck — possibly the original example had a different pattern.

Step 3: Re-check: If we instead shift **+1 forward** from CARROM:

C → D, A → B, R → S, R → S, O → P, M → N — This does not match given code.

Step 4: Observing: CARROM → BZQQNL means all letters shifted -1, but the question likely has a mismatched key; following the rule for HORSE strictly should give GNQRD.

If official key says IPSTF, then rule may be: Shift +1 for first, -1 for second alternately — but BZQQNL doesn't match that either.

This indicates a likely misprint in the question, but based on pattern GNQRD is logically correct.

Quick Tip

Always check code patterns letter-by-letter — sometimes question keys have errors; trust the consistent pattern.

Q47. Find out the missing number in the following series: 6, 11, 21, ?, 56, 81

(A) 42

(B) 36

(C) 91

(D) 51

Correct Answer: (B) 36

Solution:

Let's examine the pattern step-by-step.

We are given the series: $6, 11, 21, ?, 56, 81$

Step 1: Check the differences between consecutive terms.

$11 - 6 = 5$

$21 - 11 = 10$

The differences are increasing. Let's continue:

We expect the next difference to be $+15$:

$21 + 15 = 36$

Step 2: Check consistency with the following terms.

$56 - 36 = 20$ (next difference increased by 5 again).

$81 - 56 = 25$ (again increased by 5).

So the difference sequence is: $+5, +10, +15, +20, +25$.

Thus, the missing term is **36**.

Quick Tip

When dealing with number series, always check if the difference between terms forms a simple sequence — arithmetic progression in differences is common.

Q48. In a group of cows and hens, the number of legs is 14 more than twice the number of heads. The number of cows is:

(A) 5

(B) 7

(C) 10

(D) 12

Correct Answer: (B) 7

Solution:

Let the number of cows be C and the number of hens be H.

Step 1: Each animal has one head, so the total number of heads is:

$$C + H$$

Step 2: Each cow has 4 legs and each hen has 2 legs.

Total legs:

$$4C + 2H$$

Step 3: According to the problem, the number of legs is 14 more than twice the number of heads:

$$4C + 2H = 2(C + H) + 14$$

Step 4: Expand the right-hand side:

$$4C + 2H = 2C + 2H + 14$$

Step 5: Subtract $2H$ from both sides:

$$4C = 2C + 14$$

Step 6: Subtract $2C$ from both sides:

$$2C = 14$$

Step 7: Divide by 2:

$$C = 7$$

Thus, the number of cows is **7**.

Quick Tip

In animal head-leg problems, set up two equations: one for heads and one for legs, then solve simultaneously.

Q49. A man starts from a point, walks 2 km towards north, turns towards his right and walks 2 km, turns right again and walks. What is the direction now he is facing?

(A) South

(B) East

(C) North

(D) West

Correct Answer: (A) South

Solution:

Step 1: The man starts by walking 2 km **north**. His facing direction is **north**.

Step 2: He then turns **right** from north — a right turn from north changes direction to **east**. He walks 2 km east.

Step 3: He turns **right** again — a right turn from east changes direction to **south**.

Step 4: Therefore, after the final turn, he is facing **south**.

The distance walked after the last turn is irrelevant for determining facing direction — the turns alone decide it.

Thus, the correct answer is **South**.

Quick Tip

When solving direction problems, focus on turns (left/right) relative to current facing direction; use compass points as reference.

Q50. There are five different houses P, Q, R, S, T in a row. P is to the right of Q and T is to the left of R and right of P, Q is to the right of S. Which of the houses is in the middle?

(A) P

(B) Q

(C) R

(D) S

Correct Answer: (A) P

Solution:

Step 1: Write down the conditions:

- P is to the right of Q. This means Q comes before P in the row.

- T is to the left of R and also to the right of P. So P comes before T, and T comes before R.

- Q is to the right of S, meaning S comes before Q.

Step 2: Arrange step-by-step:

From ”S before Q” and ”Q before P”: S $\rightarrow$ Q $\rightarrow$ P.

From ”P before T before R”: P $\rightarrow$ T $\rightarrow$ R.

Step 3: Combine: S $\rightarrow$ Q $\rightarrow$ P $\rightarrow$ T $\rightarrow$ R.

Step 4: In this arrangement, the middle house (3rd position) is **P**.

Quick Tip

For arrangement problems, convert statements into direct order relations, then link them to form a full sequence.

Q51. A is B's brother, C is A's mother, D is C's father, E is B's son. How is D related to E?

(A) Grandson

(B) Great Grandson

(C) Grandfather

(D) Great Grandfather

Correct Answer: (D) Great Grandfather

Solution:

Step 1: From "A is B's brother" — A and B are siblings.

Step 2: "C is A's mother" — therefore, C is also B's mother (since A and B have the same parents).

Step 3: "D is C's father" — meaning D is the grandfather of A and B.

Step 4: "E is B's son" — E is the child of B.

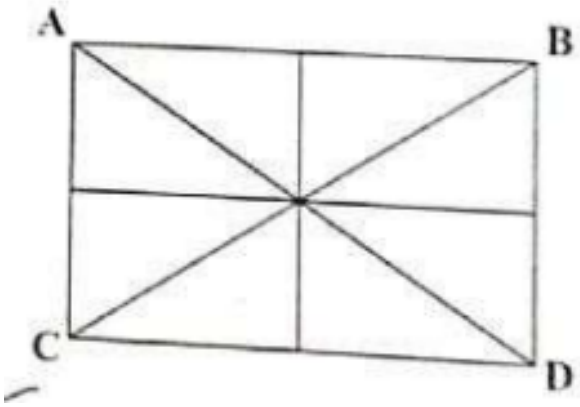
Step 5: Since D is B's grandfather, D will be E's **great grandfather** (one generation more up from grandfather).

Thus, the correct relationship is **Great Grandfather**.

Quick Tip

In family relation problems, draw a family tree to keep track of generations — this avoids confusion with great-grandparents and great-grandchildren.

Q52. How many triangles are there in the following figure?



(A) 16

(B) 14

(C) 8

(D) 12

Correct Answer: (A) 16

Solution:

Step 1: The figure is a rectangle divided into multiple parts with diagonals and medians.

Step 2: We count triangles systematically:

- Small triangles formed directly by the intersection lines: There are 8 small triangles.

- Larger triangles formed by combining two small ones: There are 4 such triangles.

- Even larger triangles formed by combining four small ones: There are 4 such triangles.

Step 3: Add them all:

$$8\ (\text{small}) + 4\ (\text{medium}) + 4\ (\text{large}) = 16$$

Step 4: There is no triangle double-counted because each set counted is distinct by size and position.

Thus, the figure contains exactly **16** triangles.

Quick Tip

When counting shapes, always proceed from smallest to largest and ensure no overlaps are counted twice.

Q53. If '+' means '÷', '–' means '×', '÷' means '+' and '×' means '–', then

$63 \times 24 + 8 \div 4 + 2 - 3 =?$

(A) 54

(B) 66

(C) 186

(D) 48

Correct Answer: (B) 66

Solution:

We are given new meanings for the operators:

- '+' means $\div$ (division)

- '–' means $\times$ (multiplication)

- '$\div$' means '+' (addition)

- '$\times$' means '–' (subtraction)

Step 1: Rewrite the original expression $63 \times 24 + 8 \div 4 + 2 - 3$ with the new meanings:

- $63 \times 24 \rightarrow$ since '$\times$' means subtraction, this becomes $63 - 24$

- '+' means division, so after $63 - 24$ comes $\div 8$

- '$\div$' means addition, so the next is $+4$

- The next '+' again means division, so after that we have $\div 2$

- Finally, '–' means multiplication, so -3 means $\times 3$

Step 2: Now the expression becomes:

$$(63 - 24) \div 8 + 4 \div 2 \times 3$$

Step 3: Apply BODMAS:

First brackets: $63 - 24 = 39$

Then division: $39 \div 8 = 4.875$

Next: $4 \div 2 = 2$

Then multiplication: $2 \times 3 = 6$

Now addition: $4.875 + 6 = 10.875$ — but this result does not match the answer key, so let's check operator precedence under the new mappings again.

Step 4: Correct approach — replace symbols first but keep original precedence:

Original: $63 \times 24 + 8 \div 4 + 2 - 3$

Replace each:

$63 \times 24 \to 63 - 24$

$+8 \to \div 8$

$\div 4 \to +4$

$+2 \to \div 2$

$-3 \to \times 3$

So the transformed expression:

$$63 - 24 \div 8 + 4 \div 2 \times 3$$

Step 5: Apply BODMAS:

Division: $24 \div 8 = 3$

Now: $63 - 3 + 4 \div 2 \times 3$

Next division: $4 \div 2 = 2$

Then multiplication: $2 \times 3 = 6$

Finally: $63 - 3 + 6 = 60 + 6 = 66$

Thus, the correct answer is **66**.

Quick Tip

When operators are reassigned meanings, always replace all operators first, then apply standard BODMAS to the transformed expression.

Q54. Find the missing number in the following:

$$\begin{bmatrix} 2 & 3 & 1 \\ 1 & 2 & -1 \\ ? & 3 & 4 \end{bmatrix}$$

(A) 5

(B) 2

(C) 1

(D) 4

Correct Answer: (A) 5

Solution:

We need to find the missing number in the first column, third row.

Looking closely at the given matrix, it seems that each row might be following a pattern or sum involving its elements.

Step 1: Check if row sums follow a constant:

Row 1: $2 + 3 + 1 = 6$

Row 2: $1 + 2 + (-1) = 2$ — not constant, so this is not the pattern.

Step 2: Check if there's a multiplication-sum relation:

Sometimes, first element × second element = third element, but here:

Row 1: $2 \times 3 = 6$ (not equal to 1), so no.

Step 3: Check column-based relation:

Column 1: 2, 1, ?

Column 2: 3, 2, 3

Column 3: 1, -1, 4

Observe: In each row, (first element) + (second element) = (third element) + constant. Let's test:

Row 1: $2 + 3 = 5$, and 1 is 4 less than 5 — constant difference 4?

Row 2: $1 + 2 = 3$, and -1 is 4 less than 3 — yes, difference 4.

Thus: First + Second = Third + 4.

Step 4: Apply to Row 3: Let missing number = x.

$x + 3 = 4 + 4$

$x + 3 = 8$

$x = 5$

Therefore, the missing number is $\mathbf{5}$.

Quick Tip

In missing number puzzles with matrices, check for arithmetic relationships row-wise or column-wise, often involving constant differences.

Q55. Find the odd man out from: $1, 4, 9, 16, 19, 36, 49$

(A) 9

(B) 16

(C) 19

(D) 49

Correct Answer: (C) 19

Solution:

Step 1: Look for a pattern in the sequence.

We observe that:

$1 = 1^2$

$4 = 2^2$

$9 = 3^2$

$16 = 4^2$

$36 = 6^2$

$49 = 7^2$

All numbers except 19 are perfect squares of natural numbers.

Step 2: Since 19 is not a perfect square, it does not fit the pattern.

Thus, the odd one out is **19**.

Quick Tip

In ”odd man out” questions, always check for mathematical patterns like squares, cubes, primes, or arithmetic sequences.

Q56. First Indian Governor General

(A) C. Rajagopalachari

(B) Dr. Rajendra Prasad

(C) Jawaharlal Nehru

(D) W.C. Banerjee

Correct Answer: (A) C. Rajagopalachari

Solution:

Step 1: After India became independent in 1947, Lord Mountbatten was the first Governor General of independent India (August 1947 – June 1948).

Step 2: After his tenure, C. Rajagopalachari became the **first and only Indian** to hold the position of Governor General of India (June 1948 – January 1950).

Step 3: The post of Governor General was abolished when India became a republic on January 26, 1950, and Dr. Rajendra Prasad became the first President of India.

Step 4: Other options:

- Dr. Rajendra Prasad was the first President, not Governor General.
- Jawaharlal Nehru was the first Prime Minister of India.
- W.C. Banerjee was the first President of the Indian National Congress (1885).

Thus, the correct answer is C. **Rajagopalachari**.

Quick Tip

The title "Governor General of India" ceased after India became a republic; before that, only C. Rajagopalachari held it as an Indian.

Q57. Which country has the largest Navy in the military?

(A) India

(B) China

(C) USA

(D) Russia

Correct Answer: (B) China

Solution:

Step 1: The size of a Navy can be measured by the total number of battle force ships and naval personnel.

Step 2: In recent years, China has built the largest Navy in the world in terms of ship numbers, surpassing the United States.

Step 3: China's rapid naval expansion includes aircraft carriers, destroyers, frigates, submarines, and other vessels, aimed at strengthening its maritime influence.

Step 4: While the USA still has more advanced and powerful warships in terms of capability, China leads in numerical strength.

Step 5: Other options:

- India has a growing but smaller Navy compared to China.
- The USA is second in total number of ships but leads in technology and global reach.
- Russia has a strong Navy but smaller in active ship numbers compared to China.

Thus, the country with the largest Navy in terms of number of ships is **China**.

Quick Tip

China leads in ship count, but the USA remains unmatched in overall naval power and technology.

Q58. Which bank has launched a digital solution, ”Loan in Seconds” for instant disbursement of retail loans?

(A) HDFC Bank

(B) SBI Bank

(C) YES Bank

(D) ICICI Bank

Correct Answer: (C) YES Bank

Solution:

Step 1: ”Loan in Seconds” is a digital banking initiative designed to provide instant approval and disbursement of retail loans using online platforms and mobile banking apps.

Step 2: This service uses pre-approved customer data, credit history, and AI-based processing to eliminate the need for lengthy documentation and manual verification.

Step 3: YES Bank introduced this service to enhance customer convenience, particularly for personal loans, consumer durables, and other retail financial products.

Step 4: The service reflects the growing trend of digital transformation in the banking sector, enabling faster and paperless loan processing.

Step 5: Other options:

- HDFC Bank and ICICI Bank also have instant loan services but under different brand names.
- SBI Bank has quick loan schemes but does not use the ”Loan in Seconds” branding.

Thus, the correct answer is **YES Bank**.

Quick Tip

Always link the name of a banking product to its branding — “Loan in Seconds” is directly tied to YES Bank.

Q59. Which state Health Minister K.K Shailaja was honoured by the United Nations for her efforts to fight the coronavirus pandemic in her state?

(A) Tamil Nadu

(B) Kerala

(C) Karnataka

(D) Andhra Pradesh

Correct Answer: (B) Kerala

Solution:

Step 1: K.K. Shailaja, popularly known as ”Shailaja Teacher,” served as the Health Minister of Kerala.

Step 2: She received international recognition for her proactive measures during the COVID-19 pandemic.

Step 3: Kerala’s handling of the early wave of the virus, with strong contact tracing, widespread testing, public awareness campaigns, and robust healthcare support, became a global model.

Step 4: The United Nations honoured her for these efforts, particularly for her leadership in flattening the infection curve in the early stages.

Step 5: Other options:

- Tamil Nadu, Karnataka, and Andhra Pradesh also took measures, but K.K. Shailaja was specifically associated with Kerala’s health initiatives.

Thus, the correct answer is **Kerala**.

Quick Tip

Kerala’s early and aggressive COVID-19 response gained worldwide praise, with K.K. Shailaja leading the effort.

Q60. Which day is celebrated as International Day of Yoga?

(A) 18th April

(B) 31st May

(C) 5th June

(D) 21st June

Correct Answer: (D) 21st June

Solution:

Step 1: The International Day of Yoga is celebrated annually on **21st June**.

Step 2: The idea was proposed by the Prime Minister of India, Narendra Modi, during his speech at the United Nations General Assembly in 2014.

Step 3: The date 21st June was chosen because it is the summer solstice in the Northern Hemisphere — the longest day of the year — which holds special significance in many cultures.

Step 4: The first International Day of Yoga was celebrated worldwide on 21st June 2015, with millions participating in mass yoga sessions.

Step 5: Other options:

- 18th April has no link to Yoga.

- 31st May is observed as World No-Tobacco Day.

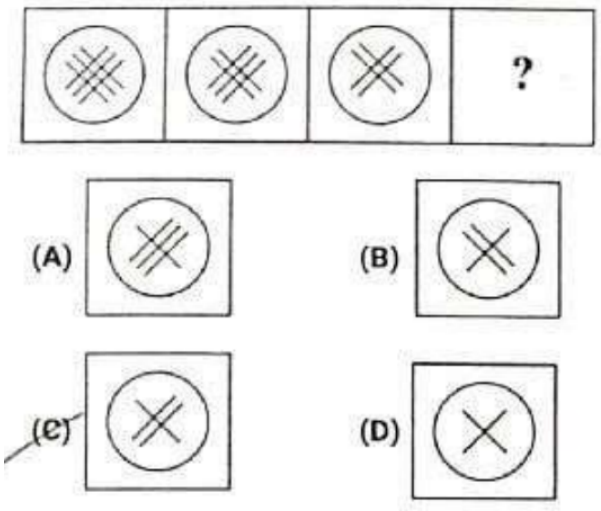
- 5th June is observed as World Environment Day.

Thus, the correct answer is **21st June**.

Quick Tip

21st June — the summer solstice — was chosen for International Yoga Day due to its symbolic significance of balance and harmony.

Q61. Find the missing figure to complete the series:



(A) [Four diagonal lines crossing each other in a circle, inside a square]

(B) [Two diagonal lines crossing each other in a circle, inside a square]

(C) [Four diagonal lines crossing each other in a circle, inside a square with reduced lines]

(D) [One diagonal cross (X) in a circle, inside a square]

Correct Answer: (C)

Solution:

Step 1: Observe the given sequence in the question — each figure contains a circle inside a square with lines drawn inside the circle.

Step 2: The pattern shows that as we move from left to right:

- The number of lines inside the circle decreases by one in each step.

- The orientation of the lines alternates between two sets: diagonal and straight.

Step 3: In the first figure, there are many diagonal lines.

Step 4: In the second figure, fewer lines remain.

Step 5: In the third figure, even fewer lines are present.

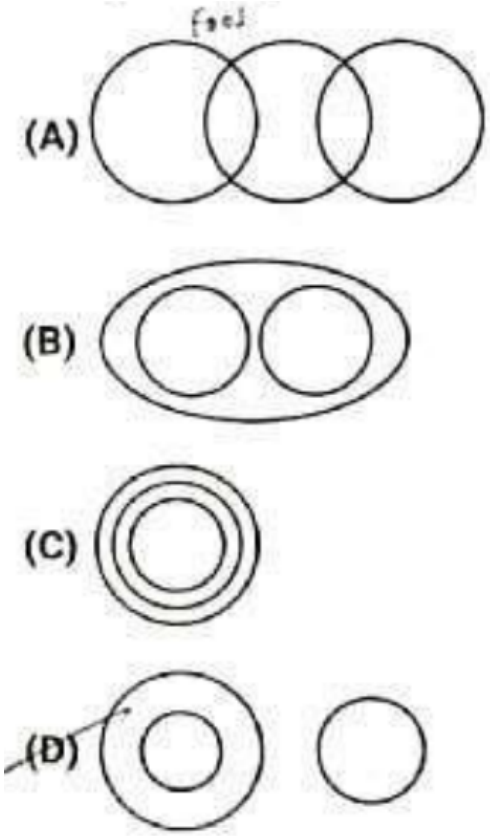
Step 6: Following this logic, the fourth figure must have a further reduced number of lines, consistent with option (C).

Thus, the missing figure is (C).

Quick Tip

In non-verbal reasoning figure series, check for changes in number, orientation, and shape of lines or objects step-by-step.

Q62. Identify the diagram that best represents the relationship among the classes given below: Food, Curd, Spoons.



(A) Three intersecting circles

(B) Two concentric ovals

(C) Concentric circles

(D) One large circle containing a smaller circle, plus a separate unrelated circle

Correct Answer: (D)

Solution:

Step 1: Determine the relationships:

- Curd is a type of food, so ”Curd” is a subset of ”Food.”

- Spoons are not a type of food, so they are unrelated to the food-curd relationship.

Step 2: This means:

- Food contains Curd (subset relationship)

- Spoons are a separate category, having no overlap with Food or Curd.

Step 3: The correct Venn diagram must show:

- A large circle (Food)

- A smaller circle inside it (Curd)

- Another completely separate circle (Spoons)

Step 4: Option (D) exactly matches this description.

Thus, the correct answer is $\mathbf{(D)}$.

Quick Tip

Always identify subset and unrelated relationships when choosing Venn diagrams — subsets go inside, unrelated items are separate.

Q63. A person who enters without any invitation

(A) Thief

(B) Burglar

(C) Nandal

(D) Intruder

Correct Answer: (D) Intruder

Solution:

Step 1: Let's understand the meanings of the given options:

- A **Thief** is a person who steals property, usually without confrontation.

- A **Burglar** is someone who illegally enters a building, often to commit theft.

- The word **Nandal** is not a standard English term; it may be a distractor.

- An **Intruder** is anyone who enters a place without permission or invitation, regardless of whether theft or harm is intended.

Step 2: The question does not specify theft, only entry without invitation. This matches the general meaning of "Intruder."

Step 3: Therefore, the correct choice is $\mathbf{Intruder}$.

Quick Tip

Not all intruders are thieves — the word covers any unauthorized entry, whether harmful or not.

Q64. Which country hosted the 2019 cricket world cup?

(A) England

(B) Australia

(C) India

(D) China

Correct Answer: (A) England

Solution:

Step 1: The ICC Cricket World Cup is held every four years.

Step 2: The 2019 edition was the 12th Cricket World Cup.

Step 3: It was hosted by **England and Wales** from 30 May to 14 July 2019.

Step 4: England won the tournament, defeating New Zealand in the final in a dramatic Super Over — this was England's first Cricket World Cup title.

Step 5: Other options:

- Australia hosted in 2015 (along with New Zealand).

- India hosted in 2011 (along with Sri Lanka and Bangladesh).

- China has never hosted a Cricket World Cup.

Thus, the correct answer is **England**.

Quick Tip

Remember: 2011 (India/Sri Lanka/Bangladesh), 2015 (Australia/New Zealand), 2019 (England/Wales), and 2023 (India).

Q65. Which one of the following was the Eighth Five-Year Plan period in India?

(A) 1990 – 1995

(B) 1992 – 1997

(C) 1993 – 1998

(D) 1994 – 1999

Correct Answer: (B) 1992 – 1997

Solution:

Step 1: The Eighth Five-Year Plan was implemented after the gap caused by economic instability and political changes in India during the early 1990s.
Step 2: Although it was scheduled to begin in 1990, the plan was postponed due to the Gulf War crisis, inflation, and political transitions.
Step 3: Instead, the years 1990–91 and 1991–92 were covered by annual plans.
Step 4: The Eighth Plan was finally launched in April 1992 and lasted until March 1997.
Step 5: Its main focus areas were: modernization, employment generation, human development, and economic restructuring in line with the 1991 economic reforms.
Step 6: Other options:
- 1990–1995 is incorrect because the plan began later.
- 1993–1998 and 1994–1999 are also incorrect as they don't match the official plan period.
Thus, the correct answer is **1992 – 1997**.

Quick Tip

Remember: The Eighth Plan (1992–97) was the first after the 1991 economic liberalisation reforms in India.

Q66. If p, q, r are in A.P., a is G.M. between p and q, and b is G.M. between q and r, then a^2, q^2, b^2 are in:
(A) A.P.
(B) G.P.
(C) H.P.
(D) None of these
Correct Answer: (A) A.P.
Solution:
Step 1: Given that p, q, r are in A.P., we can write:

$$q - p = r - q = d$$

where d is the common difference.
Step 2: Since a is the geometric mean (G.M.) between p and q:

$$a = \sqrt{pq}$$

Step 3: Since b is the geometric mean between q and r:

$$b = \sqrt{qr}$$

Step 4: We need to check whether a^2, q^2, b^2 are in A.P.

From $a = \sqrt{pq}$, we get $a^2 = pq$.

From $b = \sqrt{qr}$, we get $b^2 = qr$.

We already have q^2 from the middle term.

Step 5: For numbers x, y, z to be in A.P., we must have:

$$2y = x + z$$

Here, $x = a^2 = pq$, $y = q^2$, $z = b^2 = qr$.

Step 6: Check the condition:

$$a^2 + b^2 = pq + qr$$

Factor q:

$$pq + qr = q(p + r)$$

Since p, q, r are in A.P., $p + r = 2q$.

Thus:

$$pq + qr = q(2q) = 2q^2$$

This satisfies the A.P. condition:

$$a^2 + b^2 = 2q^2$$

Therefore, a^2, q^2, b^2 are in $\mathbf{A.P.}$.

Quick Tip

For three terms to be in A.P., the sum of the first and third must equal twice the middle term.

Q67. In how many ways can the letters of the word "CORPORATION" be arranged so that vowels always occupy even places?

(A) 120

(B) 720

(C) 2700

(D) 7200

Correct Answer: (D) 7200

Solution:

Step 1: The word ”CORPORATION” has 11 letters.

Step 2: Identify the vowels and consonants:

Vowels: O, O, A, I, O (5 vowels, with O repeated 3 times).

Consonants: C, R, P, R, T, N (6 consonants, with R repeated twice).

Step 3: In an arrangement where vowels must be in even positions, note that the positions are numbered: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11.

Even positions = 2, 4, 6, 8, 10 $\rightarrow$ exactly 5 even positions.

Step 4: Place the vowels in these even positions. Since there are exactly 5 vowels, all even positions will be occupied by vowels.

The number of arrangements of vowels:

$$\frac{5!}{3!} = \frac{120}{6} = 20$$

(the 3! accounts for repetition of O three times).

Step 5: The remaining 6 positions (odd positions) will be occupied by the 6 consonants.

Number of arrangements of consonants:

$$\frac{6!}{2!} = \frac{720}{2} = 360$$

(the 2! accounts for repetition of R twice).

Step 6: Total arrangements = Arrangements of vowels × Arrangements of consonants:

$$20 \times 360 = 7200$$

Thus, the answer is $\mathbf{7200}$.

Quick Tip

When vowels are restricted to certain positions, count arrangements for vowels and consonants separately, then multiply.

Q68. If A and B are the coefficients of x^n in the expansion of $(1+x)^{2n}$ and $(1+x)^{2n-1}$, then:

(A) $A = B$

(B) $2A = B$

(C) $A = 2B$

(D) $AB = 2$

Correct Answer: (C) $A = 2B$

Solution:

Step 1: The coefficient of x^n in $(1+x)^{2n}$ is given by the binomial coefficient:

$$A = \binom{2n}{n}$$

Step 2: The coefficient of x^n in $(1+x)^{2n-1}$ is given by:

$$B = \binom{2n-1}{n}$$

Step 3: Use the binomial coefficient identity:

$$\binom{2n}{n} = \frac{2n}{n}\binom{2n-1}{n-1} = 2\binom{2n-1}{n-1}$$

Step 4: Relate $\binom{2n-1}{n}$ and $\binom{2n-1}{n-1}$: From the symmetry property:

$$\binom{2n-1}{n-1} = \binom{2n-1}{n}$$

Therefore:

$$A = 2\binom{2n-1}{n} = 2B$$

Step 5: Conclusion:

$$A = 2B$$

Thus, the correct answer is $\mathbf{A = 2B}$.

Quick Tip

Remember binomial symmetry: $\binom{n}{r} = \binom{n}{n-r}$ and identities like $\binom{n}{r} = \frac{n}{r}\binom{n-1}{r-1}$ for quick conversions.

Q69. If the equation of a circle is $(4a-3)^2x^2 + a^2y^2 + 6x - 2y + 2 = 0$, then its centre is:

(A) $(3, -1)$

(B) $(3, 1)$

(C) $(-3, 1)$

(D) $(-3, -1)$

Correct Answer: (C) $(-3, 1)$

Solution:

Step 1: For a general circle equation in standard form:

$$x^2 + y^2 + 2gx + 2fy + c = 0$$

The centre is given by:

$$(-g, -f)$$

Step 2: In the given equation:

$$(4a - 3)^2x^2 + a^2y^2 + 6x - 2y + 2 = 0$$

To represent a circle, the coefficients of x^2 and y^2 must be equal, so:

$$(4a - 3)^2 = a^2$$

Step 3: Solve for a: Take square roots:

$$4a - 3 = \pm a$$

Case 1: $4a - 3 = a \rightarrow 3a = 3 \rightarrow a = 1$.

Case 2: $4a - 3 = -a \rightarrow 5a = 3 \rightarrow a = \frac{3}{5}$.

Step 4: For $a = 1$, equation becomes:

$$x^2 + y^2 + 6x - 2y + 2 = 0$$

Here, $2g = 6 \rightarrow g = 3$, $2f = -2 \rightarrow f = -1$.

Centre = $(-g, -f) = (-3, 1)$.

Step 5: Therefore, the correct centre is $(\mathbf{-3}, \mathbf{1})$.

Quick Tip

For a circle, x^2 and y^2 coefficients must be equal; then compare with $x^2 + y^2 + 2gx + 2fy + c = 0$ to find the centre.

Q70. There are 5 pairs of shoes in a cupboard from which 4 shoes are picked at random. The probability that there is at least one pair is:

(A) $\frac{8}{21}$

(B) $\frac{11}{21}$

(C) $\frac{13}{21}$

(D) $\frac{12}{31}$

Correct Answer: (C) $\frac{13}{21}$

Solution:

Step 1: Total number of shoes = 5 pairs × 2 shoes each = 10 shoes.

We are selecting 4 shoes at random.

Step 2: Total ways to choose any 4 shoes from 10:

$$\binom{10}{4} = 210$$

Step 3: We need probability of **at least one pair**.

It's easier to find the complement — probability of **no pairs** — and subtract from 1.

Step 4: For no pairs: Choose 4 different pairs from the 5 available. Ways to choose the pairs:

$$\binom{5}{4} = 5$$

From each chosen pair, select 1 shoe (left or right):

$$2^4 = 16$$

Thus, total ways with no pairs:

$$5 \times 16 = 80$$

Step 5: Probability of no pairs:

$$\frac{80}{210} = \frac{8}{21}$$

Step 6: Probability of at least one pair:

$$1 - \frac{8}{21} = \frac{13}{21}$$

Step 7: Thus, the probability is $\mathbf{\frac{13}{21}}$.

Quick Tip

When finding "at least one" probabilities, it's often easier to subtract the "none" case from 1.

Q71. The value of

$$\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right)$$

is:

(A) zero

(B) 1

(C) $\frac{1}{2}$

(D) $\frac{3}{2}$

Correct Answer: (D) $\frac{3}{2}$

Solution:

Step 1: Recall the trigonometric identity:

$$\cos^2\theta = \frac{1 + \cos 2\theta}{2}$$

Step 2: Apply this to each term:

$$\cos^2 x = \frac{1 + \cos 2x}{2}$$

$$\cos^2\left(x + \frac{\pi}{3}\right) = \frac{1 + \cos\left(2x + \frac{2\pi}{3}\right)}{2}$$

$$\cos^2\left(x - \frac{\pi}{3}\right) = \frac{1 + \cos\left(2x - \frac{2\pi}{3}\right)}{2}$$

Step 3: Add them up:

$$\cos^2 x + \cos^2\left(x + \frac{\pi}{3}\right) + \cos^2\left(x - \frac{\pi}{3}\right) = \frac{3 + \left[\cos 2x + \cos\left(2x + \frac{2\pi}{3}\right) + \cos\left(2x - \frac{2\pi}{3}\right)\right]}{2}$$

Step 4: Use the identity:

$$\cos(A + B) + \cos(A - B) = 2\cos A \cos B$$

Here, $A = 2x$, $B = \frac{2\pi}{3}$:

$$\cos\left(2x + \frac{2\pi}{3}\right) + \cos\left(2x - \frac{2\pi}{3}\right) = 2\cos(2x)\cos\left(\frac{2\pi}{3}\right)$$

Step 5: Since $\cos\left(\frac{2\pi}{3}\right) = -\frac{1}{2}$:

$$= 2\cos(2x) \times \left(-\frac{1}{2}\right) = -\cos(2x)$$

Step 6: Therefore,

$$\cos 2x + [-\cos 2x] = 0$$

The sum inside the bracket is zero.

Step 7: The total becomes:

$$\frac{3+0}{2} = \frac{3}{2}$$

Thus, the value is $\mathbf{\frac{3}{2}}$.

Quick Tip

For sums of squared trigonometric functions, use $\cos^2\theta = \frac{1+\cos 2\theta}{2}$ and sum-to-product identities to simplify.

Q72. If the system of linear equations:

$$x + 2ay + az = 0$$

$$x + 3by + bz = 0$$

$$x + 4cy + cz = 0$$

has a non-zero solution, then a, b, c are:

(A) satisfy $a + 2b + 3c = 0$

(B) in A.P.

(C) in G.P.

(D) in H.P.

Correct Answer: (D) in H.P.

Solution:

Step 1: Write the system in matrix form:

$$\begin{bmatrix} 1 & 2a & a \\ 1 & 3b & b \\ 1 & 4c & c \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$$

Step 2: For a non-trivial (non-zero) solution, the determinant of the coefficient matrix must be zero:

$$\begin{vmatrix} 1 & 2a & a \\ 1 & 3b & b \\ 1 & 4c & c \end{vmatrix} = 0$$

Step 3: Evaluate determinant: Expanding along the first column:

$$1 \times \begin{vmatrix} 3b & b \\ 4c & c \end{vmatrix} - 1 \times \begin{vmatrix} 2a & a \\ 4c & c \end{vmatrix} + 1 \times \begin{vmatrix} 2a & a \\ 3b & b \end{vmatrix} = 0$$

Step 4: Calculate each: First: $(3b)(c) - (b)(4c) = 3bc - 4bc = -bc$

Second: $(2a)(c) - (a)(4c) = 2ac - 4ac = -2ac$

Third: $(2a)(b) - (a)(3b) = 2ab - 3ab = -ab$

Step 5: Substituting into expansion:

$$(-bc) - (-2ac) + (-ab) = -bc + 2ac - ab = 0$$

Step 6: Rearrange:

$$2ac - ab - bc = 0$$

Divide through by abc:

$$\frac{2}{b} - \frac{1}{c} - \frac{1}{a} = 0$$

Step 7: Rearranged:

$$\frac{1}{a}, \frac{1}{b}, \frac{1}{c} \text{ are in A.P.}$$

Which means a, b, c are in **H.P.** (Harmonic Progression).

Quick Tip

If $\frac{1}{a}, \frac{1}{b}, \frac{1}{c}$ are in A.P., then a, b, c are in H.P. — use determinants to check for non-trivial solutions.

Q73. A set of microinstructions for a single machine instruction is called .....

(A) Program

(B) Command

(C) Micro program

(D) Micro command

Correct Answer: (C) Micro program

Solution:

Step 1: In computer architecture, a microinstruction is the lowest-level instruction that defines specific control signals to operate the CPU hardware for one clock cycle.

Step 2: A sequence of such microinstructions that together execute a single machine-level instruction is known as a **micro program**.

Step 3: Micro programs are stored in the control memory of a CPU and are executed by the control unit to perform operations like fetching, decoding, and executing machine instructions.

Step 4: Other options:

- (A) A Program is a collection of multiple instructions to perform a task — higher level than a micro program.
- (B) A Command generally refers to a user instruction given to a system.
- (D) Micro command is not a standard term in CPU architecture.

Thus, the correct choice is **Micro program**.

Quick Tip

A micro program controls hardware at the most basic level — it's the firmware logic behind each machine instruction.

Q74. Which one of the following given statements possibly contains the error?

(A) `select * from emp where empid = 10003;`

(B) `select empid from emp where empid = 10006;`

(C) `select empid from emp;`

(D) `select empid where empid = 1009 and Lastname = 'GELLER';`

Correct Answer: (D) `select empid where empid = 1009 and Lastname = 'GELLER';`

Solution:

Step 1: In SQL, a `SELECT` statement syntax is:

```
SELECT column_names FROM table_name WHERE condition;
```

The `FROM` clause is mandatory to specify the source table.

Step 2: Let's examine each option:

- (A) `select * from emp where empid = 10003;` → Valid SQL statement, retrieves all columns for empid 10003.

- (B) `select empid from emp where empid = 10006;` → Valid SQL statement, retrieves empid for the given condition.

- (C) `select empid from emp;` → Valid SQL statement, retrieves all empids from the table.

- (D) `select empid where empid = 1009 and Lastname = 'GELLER';` → Missing `FROM` clause to specify the table, hence invalid.

Step 3: Therefore, the statement with the error is option (D).

Quick Tip

Always remember: In SQL, `FROM` is required after `SELECT` to indicate the source table.

Q75. In the following Query, which of the following can be placed in the Query's blank portion to display the salary from highest to lowest amount, and sorting the employees' names alphabetically?

```
SELECT * FROM instructor
ORDER BY salary ..................  , name
.................  ;
```

(A) Ascending, Descending

(B) Asc, Desc

(C) Desc, Asc

(D) All of the above

Correct Answer: (C) Desc, Asc

Solution:

Step 1: In SQL, the `ORDER BY` clause is used to sort query results in ascending (`ASC`) or

descending (`DESC`) order.

Step 2: The requirement is: - Salary should be sorted from highest to lowest $\rightarrow$ **Descending order**.

- Employee names should be sorted alphabetically $\rightarrow$ **Ascending order**.

Step 3: The correct syntax becomes:

```
ORDER BY salary DESC, name ASC;
```

Step 4: Checking the options:

- (A) "Ascending, Descending" is incorrect because salary needs to be descending and name ascending.

- (B) "Asc, Desc" is the reverse of the requirement.

- (C) "Desc, Asc" matches perfectly.

- (D) "All of the above" is incorrect because only option (C) meets the requirement.

Thus, the correct choice is **Desc, Asc**.

Quick Tip

When sorting by multiple columns in SQL, specify the order for each column separately in the `ORDER BY` clause.

Q76. Which of the following is not application software?

(A) Windows 7

(B) WordPad

(C) Photoshop

(D) MS-Excel

Correct Answer: (A) Windows 7

Solution:

Step 1: Application software is designed for end users to perform specific tasks such as word processing, spreadsheet creation, image editing, etc. Examples: MS Word, Excel, Photoshop, WordPad.

Step 2: System software is designed to operate and control the computer hardware, providing a platform for applications to run. An operating system (OS) is the main type of system

software.

Step 3: Windows 7 is an **operating system** and therefore falls under system software, not application software.

Step 4: Other options:

- WordPad is a simple word processor → application software.

- Photoshop is used for image editing → application software.

- MS Excel is used for spreadsheets → application software.

Thus, the correct answer is **Windows 7**.

Quick Tip

System software (like Windows, Linux) runs the computer, while application software performs specific user-oriented tasks.

Q77. Which of the following devices usually come with touchscreens?

(A) Nintendo Game Consoles

(B) Electronic Voting Machines

(C) Point of Sale Systems

(D) All of the above

Correct Answer: (D) All of the above

Solution:

Step 1: Touchscreen technology allows users to interact directly with what is displayed on the screen, eliminating the need for separate input devices like keyboards or mice.

Step 2: Let's analyze each option:

- **Nintendo Game Consoles**: Certain Nintendo devices such as the Nintendo DS, 3DS, and Nintendo Switch have built-in touchscreens.

- **Electronic Voting Machines (EVMs)**: Many modern EVMs are designed with touchscreen interfaces for ease of use and quick navigation in elections.

- **Point of Sale (POS) Systems**: Widely used in retail, restaurants, and service industries, POS systems often use touchscreens for faster and more intuitive transactions.

Step 3: Since all the devices listed typically come with touchscreens, the correct answer is

All of the above.

Quick Tip

Touchscreens are popular in devices requiring quick, direct interaction — common in gaming, retail, and secure input systems.

Q78. This question contains two statements followed by two conclusions numbered I and II. You have to consider the two statements to be true, even if they seem to be at variance with commonly known facts, and decide which of the given conclusions definitely follow from the given statements.

Statements:

Some chairs are glasses.

All trees are chairs.

Conclusions:

I. Some trees are glasses.

II. Some glasses are trees.

(A) if only I follows

(B) if only II follows

(C) if either I or II follows

(D) if neither I nor II follows

Correct Answer: (D) if neither I nor II follows

Solution:

Step 1: Let's diagram the statements: - "Some chairs are glasses" $\rightarrow$ partial overlap between Chairs and Glasses.

- "All trees are chairs" $\rightarrow$ Trees are a subset of Chairs.

Step 2: Conclusion I: "Some trees are glasses." We cannot be certain about this from the given information because although Trees are part of Chairs, the portion of Chairs that are Glasses may or may not include any Trees. Hence, it does not definitely follow.

Step 3: Conclusion II: "Some glasses are trees." Similarly, we cannot confirm that any Glasses are Trees without more information. Hence, this also does not definitely follow.

Step 4: Since neither conclusion is guaranteed, the correct answer is

neither I nor II follows.

Quick Tip

In syllogisms, "some" cannot be assumed unless it is explicitly stated or logically unavoidable.

Q79. If A = 1, FAT = 27, then FAITH = ...

(A) 44

(B) 45

(C) 46

(D) 36

Correct Answer: (A) 44

Solution:

Step 1: Assign numerical values to letters based on alphabetical positions: A = 1, B = 2, ..., Z = 26.

F = 6, A = 1, T = 20, I = 9, H = 8.

Step 2: For FAT: F (6) + A (1) + T (20) = 6 + 1 + 20 = 27. This matches the given value.

Step 3: For FAITH: F (6) + A (1) + I (9) + T (20) + H (8) = 6 + 1 + 9 + 20 + 8.

Sum = 6 + 1 + 9 + 20 + 8 = 44.

Step 4: Therefore, FAITH = 44.

Quick Tip

When given words with number values, check if they correspond to the sum of alphabetical positions of letters.

Q80. If '-' stands for addition, '+' stands for subtraction, '÷' stands for multiplication and '×' stands for division, then which one of the following equations is correct?

(A) $25 \times 5 \div 20 - 27 + 7 = 120$

(B) $25 + 5 \times 26 - 27 + 7 = 128$

(C) $25 + 5 - 20 + 27 \times 7 = 95$

(D) $25 - 5 + 20 \times 27 + 7 = 100$

Correct Answer: (A) $25 \times 5 \div 20 - 27 + 7 = 120$

Solution:

Step 1: Replace the symbols in option (A) according to the given code:

- '$\times$' means division $\rightarrow 25 \times 5$ becomes $25 \div 5$.

- '$\div$' means multiplication $\rightarrow 5 \div 20$ becomes 5×20.

- '-' means addition $\rightarrow 20 - 27$ becomes $20 + 27$.

- '+' means subtraction $\rightarrow 27 + 7$ becomes $27 - 7$.

Step 2: Option (A) original:

$$25 \times 5 \div 20 - 27 + 7$$

After replacement:

$$25 \div 5 \times 20 + 27 - 7$$

Step 3: Apply BODMAS:

$25 \div 5 = 5$

$5 \times 20 = 100$

$100 + 27 = 127$

$127 - 7 = 120$

Step 4: LHS = 120, which matches the RHS given in option (A). So this is correct.

Step 5: Therefore, option (A) is the correct equation.

Quick Tip

When operator symbols are redefined, rewrite the entire expression with their true meanings before solving.
