CAT 2023 SOLVED PAPER (SLOT-3)

Section I: VARC

Question Numbers (1 to 4): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Understanding romantic aesthetics is not a simple undertaking for reasons that are internal to the nature of the subject. Distinguished scholars, such as Arthur Lovejoy, Northrop Frye and Isaiah Berlin, have remarked on the notorious challenges facing any attempt to define romanticism. Lovejoy, for example, claimed that romanticism is "the scandal of literary history and criticism" . . . The main difficulty in studying the romantics, according to him, is the lack of any "single real entity, or type of entity" that the concept "romanticism" designates. Lovejoy concluded, "the word 'romantic' has come to mean so many things that, by itself, it means nothing" . . .

The more specific task of characterizing romantic aesthetics adds to these difficulties an air of paradox. Conventionally, "aesthetics" refers to a theory concerning beauty and art or the branch of philosophy that studies these topics. However, many of the romantics rejected the identification of aesthetics with a circumscribed domain of human life that is separated from the practical and theoretical domains of life. The most characteristic romantic commitment is to the idea that the character of art and beauty and of our engagement with them should shape all aspects of human life. Being fundamental to human existence, beauty and art should be a central ingredient not only in a philosophical or artistic life, but also in the lives of ordinary men and women. Another challenge for any attempt to characterize romantic aesthetics lies in the fact that most of the romantics were poets and artists whose views of art and beauty are, for the most part, to be found not in developed theoretical accounts, but in fragments, aphorisms and poems, which are often more elusive and suggestive than conclusive.

Nevertheless, in spite of these challenges the task of characterizing romantic aesthetics is neither impossible nor undesirable, as numerous thinkers responding to Lovejoy's radical skepticism have noted. While warning against a reductive definition of romanticism, Berlin, for example, still heralded the need for a general characterization: "[Although] one does have a certain sympathy with Lovejoy's despair…[he is] in this instance mistaken. There was a romantic movement…and it is important to discover what it is" . . .

Recent attempts to characterize romanticism and to stress its contemporary relevance follow this path. Instead of overlooking the undeniable differences between the variety of romanticisms of different nations that Lovejoy had stressed, such studies attempt to characterize romanticism, not in terms of a single definition, a specific time, or a specific place, but in terms of "particular philosophical questions and concerns" . . .

While the German, British and French romantics are all considered, the central protagonists in the following are the German romantics. Two reasons explain this focus: first, because it has paved the way for the other romanticisms, German romanticism has a pride of place among the different national romanticisms . . . Second, the aesthetic outlook that was developed in Germany roughly between 1796 and 1801–02 — the period that corresponds to the heyday of what is known as "Early Romanticism" . . .— offers the most philosophical expression of romanticism since it is grounded primarily in the epistemological, metaphysical, ethical, and political concerns that the German romantics discerned in the aftermath of Kant's philosophy.

1. Which one of the following statements is NOT supported by the passage?
1. Recent studies on romanticism seek to refute the differences between national romanticisms.
2. Characterising romantic aesthetics is both possible and desirable, despite the challenges involved.
3. Many romantics rejected the idea of aesthetics as a domain separate from other aspects of life.
4. Romantic aesthetics are primarily expressed through fragments, aphorisms, and poems.

2. According to the romantics, aesthetics:
1. should be confined to a specific domain separate from the practical and theoretical aspects of life.
2. is primarily the concern of philosophers and artists, rather than of ordinary people.
3. permeates all aspects of human life, philosophical and mundane.
4. is widely considered to be irrelevant to human existence.

3. According to the passage, recent studies on romanticism avoid "a single definition, a specific time, or a specific place" because they:
1. prefer to focus on the fundamental concerns of the romantics.
2. prefer to highlight the paradox of romantic aesthetics as a concept.
3. understand that the variety of romanticisms renders a general analysis impossible.
4. seek to discredit Lovejoy's scepticism regarding romanticism.

4. The main difficulty in studying romanticism is the:
1. absence of written accounts by romantic poets and artists.
2. controversial and scandalous history of romantic literature.
3. lack of clear conceptual contours of the domain.
4. elusive and suggestive nature of romantic aesthetics.

Sol: For questions 1 to 4:

Passage Explanation:

Para 1: The first paragraph introduces the topic of romantic aesthetics, emphasizing its complexity. Renowned scholars like Arthur Lovejoy, Northrop Frye, and Isaiah Berlin are mentioned for their commentary on the difficulty of defining romanticism. Lovejoy, in particular, is quoted as saying that romanticism is a complex and elusive concept in literary history and criticism. He highlights the challenge due to the absence of a single, clear definition for "romanticism," suggesting that the term is so broad and varied in its usage that it risks losing its meaning.

Para 2: The second paragraph delves deeper into the challenges of characterizing romantic aesthetics. It starts by defining conventional aesthetics as a theory or philosophical study of beauty and art. The paragraph then notes a paradox in romantic aesthetics: many romantics themselves rejected the notion of confining aesthetics to a specific domain, separate from practical and theoretical life aspects. Instead, they viewed aesthetics as integral to all facets of human existence. This commitment of the romantics makes studying and characterizing their aesthetics more complex, especially given that their views are often expressed in non-theoretical forms like poetry, making them elusive and suggestive rather than conclusive.

Para 3: In the third paragraph, the focus shifts to the feasibility and desirability of studying romantic aesthetics despite the challenges. It addresses Lovejoy's skepticism about defining romanticism, with Isaiah Berlin countering Lovejoy by emphasizing the importance of understanding romanticism as a significant movement. The paragraph suggests that while a reductive definition should be avoided, a general characterization of romanticism is both possible and necessary.

Para 4: The final paragraph discusses recent attempts to characterize romanticism, noting that these don't overlook the differences between national romanticisms as Lovejoy did, but instead try to define it in terms of specific philosophical questions and concerns. The emphasis is on German romantics, given their pivotal role and the philosophical depth of their contributions, particularly in the context of Kant's philosophy.

1. 1 **Question Explanation:** The question asks which statement is NOT supported by the passage. It requires identifying the option that either contradicts or is not mentioned in the passage's content regarding romanticism and its characterization.

Correct Answer:

1. **Recent studies on romanticism seek to refute the differences between national romanticisms.**

   This option is not supported by the passage. The passage actually suggests that recent studies do not overlook the differences among national romanticisms. Instead, they aim to characterize romanticism based on particular philosophical questions, acknowledging these differences.

Incorrect Answers:

2. **Characterizing romantic aesthetics is both possible and desirable:** This idea is directly stated in the passage, especially in the third paragraph, where the response to Lovejoy's skepticism is discussed.
3. **Many romantics rejected the idea of aesthetics as a separate domain:** This concept is outlined in the second paragraph, where the paradox in romantic aesthetics is discussed.
4. **Romantic aesthetics are primarily expressed through fragments, aphorisms, and poems:** The passage, in the second paragraph, notes that the views of romantics are often found in non-theoretical forms such as fragments and poems, which aligns with this statement.

2. 3 **Question Explanation:** Question 2 asks about the romantics' perspective on aesthetics. It seeks to determine how the romantics viewed the role and scope of aesthetics in human life, based on the information provided in the passage.

Correct Answer:

3. **permeates all aspects of human life, philosophical and mundane.**

   The passage, particularly in its second paragraph, discusses the romantics' view on aesthetics. It highlights that many romantics rejected the idea of confining aesthetics to a separate, circumscribed domain of human life, distinct from practical and theoretical aspects. Instead, they believed that aesthetics – the character of art and beauty and our engagement with them – should shape all aspects of human existence. This belief implies that aesthetics, according to the romantics, is not just a matter of philosophical or artistic concern but is fundamental and pervasive in everyday life as well.

Incorrect Answers:

1. **should be confined to a specific domain separate from the practical and theoretical aspects of life:** This option is directly contradicted by the passage, which states that the romantics rejected the confinement of aesthetics to a separate domain.
2. **is primarily the concern of philosophers and artists, rather than of ordinary people:** The passage argues against this, noting the romantics' belief that beauty and art should be central in the lives of not only philosophers and artists but also ordinary people.
4. **is widely considered to be irrelevant to human existence:** This statement is the opposite of the romantics' view as described in the passage. The romantics saw aesthetics as fundamental to human existence, not irrelevant.

   The passage clearly communicates the romantics' expansive view of aesthetics, seeing it as an integral and pervasive aspect of human life, influencing both philosophical thought and everyday experiences.

3. 1 **Question Explanation:** Question 3 inquires about the approach recent studies on romanticism take to avoid defining the movement in terms of "a single definition, a specific time, or a specific place." The question requires identifying the reason behind this approach as presented in the passage.

Correct Answer:

1. **prefer to focus on the fundamental concerns of the romantics.**

   The correct answer aligns with the key point in the fourth paragraph of the passage. The passage explains that recent studies on romanticism do not attempt to define it narrowly by time, place, or a single definition. Instead, these studies aim to characterize romanticism based on "particular philosophical questions and concerns." This approach suggests a focus on the fundamental and central ideas that the romantics grappled with, rather than confining the movement to specific historical or geographical contexts.

Incorrect Answers:

2. **prefer to highlight the paradox of romantic aesthetics as a concept:** While the passage does discuss the paradoxical nature of romantic aesthetics, it does not suggest that this is the reason why recent studies avoid a single definition or specific time/place.
3. **understand that the variety of romanticisms renders a general analysis impossible:** The passage actually counters this view by suggesting that, despite the variety, a general characterization focused on fundamental concerns is both possible and desirable.

4. **seek to discredit Lovejoy's scepticism regarding romanticism:** Discrediting Lovejoy's skepticism is not the stated goal of these studies. While they respond to his skepticism, they do so by focusing on the philosophical aspects of romanticism, not by seeking to discredit his views.

   The passage underscores the idea that recent studies on romanticism aim to capture the essence of the movement through its core philosophical concerns, rather than limiting it to specific historical or geographical parameters. This approach acknowledges the diversity within romanticism while still striving for a meaningful characterization.

4. 3 Question Explanation: Question 4 asks about the main difficulty in studying romanticism as indicated in the passage. It requires identifying the primary challenge highlighted in the text concerning the understanding and definition of romanticism.

Correct Answer:

3. **lack of clear conceptual contours of the domain.**

   The correct answer is directly supported by the first paragraph of the passage. Arthur Lovejoy, a noted scholar, is quoted as saying that romanticism is a complex and elusive concept in literary history and criticism. The main challenge, as highlighted by Lovejoy, lies in the absence of a single, clear entity or type that the term "romanticism" designates. This issue points to the lack of clear conceptual contours or a definitive definition of romanticism, making it a challenging subject for study and characterization. Lovejoy even concludes that the word "romantic" has become so broadly used that it essentially means nothing by itself, underlining the difficulty in pinning down its meaning.

Incorrect Answers:

1. **absence of written accounts by romantic poets and artists:** The passage does not suggest that there is an absence of written accounts. Rather, it mentions that the views of romantics are often found in fragments, aphorisms, and poems.
2. **controversial and scandalous history of romantic literature:** While Lovejoy refers to romanticism as the "scandal of literary history and criticism," this is more about the conceptual challenges of defining romanticism, not about any actual scandal or controversy in its history.
4. **elusive and suggestive nature of romantic aesthetics:** Although the passage mentions the elusive and suggestive nature of romantic expressions, this is not described as the main difficulty. The central challenge is the conceptual vagueness and the lack of a singular definition for romanticism.

   The passage makes it clear that the primary challenge in studying romanticism is its conceptual ambiguity. There is no single, universally accepted definition or clear boundaries that encapsulate what romanticism is, making it a complex and elusive subject for scholarly study.

Question Numbers (5 to 8): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Steven Pinker's new book, "Rationality: What It Is, Why It Seems Scarce, Why It Matters," offers a pragmatic dose of measured optimism, presenting rationality as a fragile but achievable ideal in personal and civic life. . . . Pinker's ambition to illuminate such a crucial topic offers the welcome prospect of a return to sanity. . . . It's no small achievement to make formal logic, game theory, statistics and Bayesian reasoning delightful topics full of charm and relevance.

It's also plausible to believe that a wider application of the rational tools he analyzes would improve the world in important ways. His primer on statistics and scientific uncertainty is particularly timely and should be required reading before consuming any news about the [COVID] pandemic. More broadly, he argues that less media coverage of shocking but vanishingly rare events, from shark attacks to adverse vaccine reactions, would help prevent dangerous overreactions, fatalism and the diversion of finite resources away from solvable but less-dramatic issues, like malnutrition in the developing world.

It's a reasonable critique, and Pinker is not the first to make it. But analyzing the political economy of journalism — its funding structures, ownership concentration and increasing reliance on social media shares — would have given a fuller picture of why so much coverage is so misguided and what we might do about it.

Pinker's main focus is the sort of conscious, sequential reasoning that can track the steps in a geometric proof or an argument in formal logic. Skill in this domain maps directly onto the navigation of many real-world problems, and Pinker shows how greater mastery of the tools of rationality can improve decision-making in medical, legal, financial and many other contexts in which we must act on uncertain and shifting information. . . .

Despite the undeniable power of the sort of rationality he describes, many of the deepest insights in the history of science, math, music and art strike their originators in moments of epiphany. From the 19th-century chemist Friedrich August Kekulé's discovery of the structure of benzene to any of Mozart's symphonies, much extraordinary human achievement is not a product of conscious, sequential reasoning. Even Plato's Socrates — who anticipated many of Pinker's points by nearly 2,500 years, showing the virtue of knowing what you do not know and examining all premises in arguments, not simply trusting speakers' authority or charisma — attributed many of his most profound insights to dreams and visions. Conscious reasoning is helpful in sorting the wheat from the chaff, but it would be interesting to consider the hidden aquifers that make much of the grain grow in the first place.

The role of moral and ethical education in promoting rational behavior is also underexplored. Pinker recognizes that rationality "is not just a cognitive virtue but a moral one." But this profoundly important point, one subtly explored by ancient Greek philosophers like Plato and Aristotle, doesn't really get developed. This is a shame, since possessing the right sort of moral character is arguably a precondition for using rationality in beneficial ways.

5. The author endorses Pinker's views on the importance of logical reasoning as it:
1. equips people with the ability to tackle challenging practical problems.
2. provides a moral compass for resolving important ethical dilemmas.
3. focuses public attention on real issues like development rather than sensational events.
4. helps people to gain expertise in statistics and other scientific disciplines.

6. The author refers to the ancient Greek philosophers to:
1. reveal gaps in Pinker's discussion of the importance of ethical considerations in rational behaviour.
2. highlight the influence of their thinking on the development of Pinker's arguments.
3. indicate the various similarities between their thinking and Pinker's conclusions.
4. show how dreams and visions have for centuries influenced subconscious behaviour and pathbreaking inventions.

7. The author mentions Kekulé's discovery of the structure of benzene and Mozart's symphonies to illustrate the point that:
1. unlike the sciences, human achievements in other fields are a mix of logical reasoning and spontaneous epiphanies.
2. great innovations across various fields can stem from flashes of intuition and are not always propelled by logical thinking.
3. Pinker's conclusions on sequential reasoning are belied by European achievements which, in the past, were more rooted in unconscious bursts of genius.
4. it is not just the creative arts, but also scientific fields that have benefitted from flashes of creativity.

8. According to the author, for Pinker as well as the ancient Greek philosophers, rational thinking involves all of the following EXCEPT:
1. arriving at independent conclusions irrespective of who is presenting the argument.
2. an awareness of underlying assumptions in an argument and gaps in one's own knowledge.
3. the belief that the ability to reason logically encompasses an ethical and moral dimension.
4. the primacy of conscious sequential reasoning as the basis for seminal human achievements.

Sol.: For questions 5 to 8:

Passage Explanation:

Para 1: The first paragraph introduces Steven Pinker's book, "Rationality: What It Is, Why It Seems Scarce, Why It Matters," framing it as a pragmatic and optimistic exploration of rationality. Pinker's work is presented as an ambitious and welcome venture that could lead to a "return to sanity." The author of the passage commends Pinker for making complex subjects like formal logic, game theory, statistics, and Bayesian reasoning engaging and relevant. This introduction sets the tone for a positive view of Pinker's approach to rationality, highlighting its potential benefits in personal and civic life.

Para 2: The second paragraph continues the discussion of Pinker's book, focusing on the practical applications of rational tools. It suggests that a wider application of these tools, as analyzed by Pinker, could significantly improve the world. The author specifically mentions Pinker's timely primer on statistics and scientific uncertainty, especially relevant to understanding news about the COVID pandemic. There is an emphasis on how media coverage often focuses on rare, sensational events, leading to skewed public perceptions and resource misallocation. The author agrees with Pinker's critique of media coverage but notes that an analysis of the political economy of journalism would have provided a more comprehensive understanding of why media coverage can be misguided.

Para 3: In the third paragraph, the author describes Pinker's focus on conscious, sequential reasoning and its applicability in various real-world contexts, including medical, legal, and financial decision-making. This section underscores Pinker's argument that mastering rationality can significantly enhance decision-making in contexts where actions are based on uncertain and shifting information. The author acknowledges Pinker's insights while also pointing out that many great scientific, mathematical, musical, and artistic achievements have originated in moments of epiphany, not solely through conscious reasoning. This contrast suggests that while rationality is powerful, it does not encompass all forms of human creativity and insight.

Para 4: The final paragraph touches upon the moral and ethical dimensions of rationality, an aspect that Pinker recognizes but does not deeply explore. The author reflects on the idea that possessing the right moral character is crucial for using rationality effectively and beneficially. This point is connected to the philosophical explorations of ancient Greek philosophers like Plato and Aristotle, who delved into the interplay between moral character and rationality. The author suggests that a deeper exploration of this connection could have added value to Pinker's discussion on rationality, indicating a missed opportunity for a more holistic treatment of the subject.

5. 1 Question Explanation: Question 5 inquires about the author's endorsement of Steven Pinker's views on logical reasoning. The question aims to identify the specific aspect of logical reasoning that the author agrees with, as highlighted in Pinker's book. It focuses on understanding which benefit of logical reasoning, as presented in the passage, the author supports.

Correct Answer:

1. **equips people with the ability to tackle challenging practical problems.**

   The author endorses Pinker's views that logical reasoning equips individuals to effectively address real-world, practical problems. In the third paragraph of the passage, the author discusses Pinker's emphasis on conscious, sequential reasoning and its direct application in various contexts like medical, legal, and financial decision-making. This alignment with Pinker's argument highlights the author's agreement that mastering rational tools, as Pinker outlines, can significantly improve how individuals navigate and solve complex, practical issues in different domains.

Incorrect Answers:

2. **provides a moral compass for resolving important ethical dilemmas:** The passage does not specifically indicate that the author believes logical reasoning provides a moral compass for ethical dilemmas. While Pinker acknowledges the moral aspect of rationality, the passage does not explicitly endorse this view.
3. **focuses public attention on real issues like development rather than sensational events:** Although the author agrees with Pinker's critique of media coverage focusing on sensational events, this agreement does not specifically relate to the endorsement of logical reasoning's importance.
4. **helps people to gain expertise in statistics and other scientific disciplines:** While the author appreciates Pinker's primer on statistics, the endorsement is more broadly about the application of rationality in practical problem-solving, rather than specifically gaining expertise in scientific disciplines.

   The author's endorsement of Pinker's views is centered on the practical applicability and utility of logical reasoning in tackling real-world challenges, aligning with Pinker's analysis of how rationality can improve decision-making across various life domains.

6. 1 **Question Explanation:** Question 6 focuses on the purpose behind the author's reference to ancient Greek philosophers in the context of Pinker's discussion on rational behavior. It aims to determine how these philosophers' views are used to complement or critique Pinker's arguments about rationality.

Correct Answer:

1. **reveal gaps in Pinker's discussion of the importance of ethical considerations in rational behavior.**

   The author uses the example of ancient Greek philosophers, specifically Plato and Aristotle, to highlight a significant aspect that is underexplored in Pinker's discussion: the role of moral and ethical education in promoting rational behavior. The fourth paragraph of the passage notes that while Pinker recognizes rationality as a moral virtue, he does not thoroughly develop this point. By referencing the ancient Greeks, who deeply explored the relationship between moral character and rationality, the author points out that understanding and utilizing rationality beneficially requires not just cognitive skills but also a well-formed moral character. This connection, richly investigated by the Greeks, is presented as a critical dimension missing in Pinker's analysis.

Incorrect Answers:

2. **highlight the influence of their thinking on the development of Pinker's arguments:** The passage does not suggest that Pinker's arguments on rationality were directly influenced by the thoughts of ancient Greek philosophers.
3. **indicate the various similarities between their thinking and Pinker's conclusions:** While there may be parallels, the passage specifically uses the Greek philosophers to point out what Pinker does not cover, rather than to draw similarities.
4. **show how dreams and visions have for centuries influenced subconscious behavior and pathbreaking inventions:** The passage mentions dreams and visions in the context of explaining that not all significant achievements stem from conscious reasoning. However, the reference to Greek philosophers is specifically linked to the ethical aspects of rational behavior, not to the role of subconscious processes in creativity.

   The use of ancient Greek philosophers in the passage serves to underline a notable omission in Pinker's treatment of rationality – the ethical and moral dimensions that are crucial for its beneficial application, a theme extensively explored by these philosophers but only briefly touched upon by Pinker.

7. 2 **Question Explanation:** Question 7 examines the reason behind the author's mention of Kekulé's discovery of benzene's structure and Mozart's symphonies. The question aims to identify what these examples illustrate about the nature of human achievement as discussed in Pinker's book on rationality.

Correct Answer:

2. **great innovations across various fields can stem from flashes of intuition and are not always propelled by logical thinking.**

   The author references Kekulé and Mozart to illustrate that extraordinary human achievements in science, music, and other fields often arise from moments of epiphany or intuition, not solely from conscious, sequential reasoning. In the third paragraph, the author contrasts Pinker's emphasis on rational, deliberate thinking with the fact that many significant discoveries and creations occur as sudden insights. These examples serve to highlight the broader spectrum of human cognition and creativity, encompassing both the rational processes emphasized by Pinker and the intuitive, spontaneous bursts of inspiration that have led to major scientific and artistic breakthroughs.

Incorrect Answers:

1. **unlike the sciences, human achievements in other fields are a mix of logical reasoning and spontaneous epiphanies:** This option incorrectly implies a separation between sciences and other fields regarding the role of intuition. The passage suggests that intuition plays a significant role in both scientific and artistic achievements.
3. **Pinker's conclusions on sequential reasoning are belied by European achievements which, in the past, were more rooted in unconscious bursts of genius:** The passage does not suggest that European achievements contradict Pinker's conclusions; rather, it presents these achievements as additional aspects of human creativity.

4. **it is not just the creative arts, but also scientific fields that have benefitted from flashes of creativity:** While this statement is true, it does not capture the specific point the author is making about the contrast between Pinker's focus on sequential reasoning and the broader nature of creativity and insight.

   The passage uses the examples of Kekulé and Mozart to underscore the idea that significant achievements often originate from intuitive insights, adding a dimension to human creativity and problem-solving that extends beyond the deliberate, logical reasoning highlighted by Pinker.

8. 4 **Question Explanation:** Question 8 probes into the conceptualization of rational thinking as presented by Steven Pinker and the ancient Greek philosophers in the passage. It asks which aspect of rational thinking is not included in their views, as discussed in the book "Rationality: What It Is, Why It Seems Scarce, Why It Matters." The question tests the reader's understanding of how Pinker and the Greek philosophers perceive rational thinking, particularly regarding its scope and application.

Correct Answer:

4. **the primacy of conscious sequential reasoning as the basis for seminal human achievements.**

   The passage, especially in the third paragraph, discusses Pinker's emphasis on conscious, sequential reasoning and its utility in various real-world situations. However, it contrasts this with the idea that many great scientific and artistic achievements come from moments of epiphany or intuition, not solely from deliberate, logical processes. Examples like Kekulé's discovery and Mozart's symphonies are cited to illustrate this point. Moreover, the reference to Socrates — a figure who predates Pinker by millennia and emphasized knowing one's ignorance and examining premises in arguments — indicates that profound insights often come from beyond conscious reasoning. Thus, while both Pinker and the Greek philosophers value rational thought, they do not assert it as the sole or primary basis for all significant human achievements.

Incorrect Answers:

1. **arriving at independent conclusions irrespective of who is presenting the argument:** The passage implies that both Pinker and the Greek philosophers value the ability to think independently, without undue influence from authority figures or charismatic individuals. This aligns with a critical aspect of rational thinking.
2. **an awareness of underlying assumptions in an argument and gaps in one's own knowledge:** Pinker's focus on rationality, as well as the philosophical teachings of ancient Greeks like Socrates, encompass an understanding of one's limitations and the importance of questioning assumptions, which is a fundamental part of rational thought.
3. **the belief that the ability to reason logically encompasses an ethical and moral dimension:** The passage acknowledges that Pinker sees rationality as a moral virtue, an idea that is also explored by Greek philosophers. This indicates that both view rational thinking as having ethical and moral implications.

   The passage illustrates that while Pinker and the Greek philosophers recognize the importance of rational, logical reasoning, they also acknowledge the role of intuition and spontaneous insight in human achievements. This perspective suggests a more comprehensive understanding of rationality, extending beyond the confines of conscious, sequential reasoning.

Question Numbers (9 to 12): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

The biggest challenge [The Nutmeg's Curse by Ghosh] throws down is to the prevailing understanding of when the climate crisis started. Most of us have accepted . . . that it started with the widespread use of coal at the beginning of the Industrial Age in the 18th century and worsened with the mass adoption of oil and natural gas in the 20th.

Ghosh takes this history at least three centuries back, to the start of European colonialism in the 15th century. He [starts] the book with a 1621 massacre by Dutch invaders determined to impose a monopoly on nutmeg cultivation and trade in the Banda islands in today's Indonesia. Not only do the Dutch systematically depopulate the islands through genocide, they also try their best to bring nutmeg cultivation into plantation mode. These are the two points to which Ghosh returns through examples from around the world. One, how European colonialists decimated not only indigenous populations but also indigenous understanding of the relationship between humans and Earth. Two, how this was an invasion not only of humans but of the Earth itself, and how this continues to the present day by looking at nature as a 'resource' to exploit. . . .

We know we are facing more frequent and more severe heatwaves, storms, floods, droughts and wildfires due to climate change. We know our expansion through deforestation, dam building, canal cutting – in short, terraforming, the word Ghosh uses – has brought us repeated disasters . . . Are these the responses of an angry Gaia who has finally had enough? By using the word 'curse' in the title, the author makes it clear that he thinks so. I use the pronoun 'who' knowingly, because Ghosh has quoted many non-European sources to enquire into the relationship between humans and the world around them so that he can question the prevalent way of looking at Earth as an inert object to be exploited to the maximum.

As Ghosh's text, notes and bibliography show once more, none of this is new. There have always been challenges to the way European colonialists looked at other civilisations and at Earth. It is just that the invaders and their myriad backers in the fields of economics, politics, anthropology, philosophy, literature, technology, physics, chemistry, biology have dominated global intellectual discourse. . . .

There are other points of view that we can hear today if we listen hard enough. Those observing global climate negotiations know about the Latin American way of looking at Earth as Pachamama (Earth Mother). They also know how such a framing is just provided lip service and is ignored in the substantive portions of the negotiations. In The Nutmeg's Curse, Ghosh explains why. He shows the extent of the vested interest in the oil economy – not only for oil-exporting countries, but also for a superpower like the US that controls oil drilling, oil prices and oil movement around the world. Many of us know power utilities are sabotaging decentralised solar power generation today because it hits their revenues and control. And how the other points of view are so often drowned out.

9. On the basis of information in the passage, which one of the following is NOT a reason for the failure of policies seeking to address climate change?

1. The global dominance of oil economies and international politics built around it.
2. The marginalised status of non-European ways of looking at nature and the environment.
3. The greed of organisations benefiting from non-renewable energy resources.
4. The decentralised characteristic of renewable energy resources like solar power.

10. All of the following can be inferred from the reviewer's discussion of "The Nutmeg's Curse", EXCEPT:

1. environmental preservation policy makers can learn a lot from non-European and/or pre-colonial societies.
2. academic discourses have always served the function of raising awareness about environmental preservation.
3. the contemporary dominant perception of nature and the environment was put in place by processes of colonialism.
4. the history of climate change is deeply intertwined with the history of colonialism.

11. Which one of the following, if true, would make the reviewer's choice of the pronoun "who" for Gaia inappropriate?

1. There is a direct cause–effect relationship between human activities and global climate change.
2. Modern western science discovers new evidence for the Earth being an inanimate object.
3. Non-European societies have perceived the Earth as a non-living source of all resources.
4. Ghosh's book has a different title: "The Nutmeg's Revenge".

12. Which one of the following best explains the primary purpose of the discussion of the colonisation of the Banda islands in "The Nutmeg's Curse"?

1. To illustrate the role played by the cultivation of certain crops in the plantation mode in contributing to climate change.
2. To illustrate how systemic violence against the colonised constituted the cornerstone of colonialism.
3. To illustrate how colonialism represented and perpetuated the mindset that has led to climate change.
4. To illustrate the first instance in history when the processes responsible for climate change were initiated.

Sol.: For questions 9 to 12:
Passage Explanation:
Para 1: "The Nutmeg's Curse" by Amitav Ghosh challenges the commonly accepted timeline of the climate crisis, suggesting it began not with the Industrial Age in the 18th century, but three centuries earlier with European colonialism in the 15th century.

Para 2: Ghosh traces the origins of the climate crisis to the 15th century, starting with a 1621 massacre by the Dutch in the Banda Islands, Indonesia, to monopolize nutmeg cultivation. He argues that European colonialists not only decimated indigenous populations but also disregarded indigenous environmental knowledge, treating nature as a resource to exploit.

Para 3: Ghosh suggests that current environmental disasters—heatwaves, storms, floods, droughts, and wildfires—could be seen as Earth's response to human terraforming activities. He challenges the view of Earth as an inert object, citing non-European perspectives on human-Earth relationships.

Para 4: The book highlights that opposition to the European colonialist worldview has always existed. However, this perspective, along with supporting economic, political, and scientific views, has dominated global discourse, overshadowing alternative viewpoints.

Para 5: Ghosh points out that alternative perspectives, like the Latin American view of Earth as Pachamama, exist but are often marginalized in global discussions, including climate negotiations. He discusses the vested interests in the oil economy and how they overpower and silence these alternative voices.

9. 4 **Question Explanation:** Question 9 challenges readers to identify which listed factor is not a reason for the failure of climate change policies as described in "The Nutmeg's Curse" by Ghosh. The question requires an understanding of the reasons Ghosh presents for policy failures and determining which of the provided options is not aligned with these reasons.

Correct Answer:

4. **The decentralised characteristic of renewable energy resources like solar power.**
   The passage does not mention the decentralized nature of renewable energy as a contributing factor to the failure of climate change policies. Instead, it focuses on the impacts of European colonialism, the dominance of oil economies, and the greed of organizations benefiting from non-renewable energy resources. The decentralization of renewable energy, such as solar power, is typically viewed as a positive aspect in the context of combating climate change, not as a reason for policy failure. Therefore, this option is not supported by the passage.

Incorrect Answers:

1. **Global dominance of oil economies:** The passage discusses the significant influence of oil economies and politics on global affairs, implying this as a contributing factor to policy failures.
2. **Marginalized status of non-European views:** Ghosh highlights how European colonialism and the marginalization of non-European perspectives have contributed to a skewed relationship with nature and the environment, which can be inferred as a reason for policy failure.
3. **Greed of organizations benefiting from non-renewable energy resources:** The passage mentions vested interests in the oil economy and the actions of power utilities against decentralized solar power, suggesting greed as a factor in policy failures.

10. 2 **Question Explanation:** Question 10 asks which statement cannot be inferred from the reviewer's discussion of "The Nutmeg's Curse." This requires identifying an idea or notion that is not supported by, or is contradictory to, the content of the passage.

Correct Answer:

2. **Academic discourses have always served the function of raising awareness about environmental preservation.**
   This statement cannot be inferred from the passage, as it does not discuss the historical role of academic discourses in environmental preservation. While the passage does mention the dominance of European perspectives in various academic fields, it does not explicitly state or imply that these discourses have consistently been focused on raising environmental awareness. Therefore, this option stands out as the one least supported by the passage.

Incorrect Answers:

1. **Environmental preservation policymakers can learn from non-European and/or pre-colonial societies:** This is implied in the passage, which discusses the value of non-European perspectives on nature and the environment.
3. **The contemporary dominant perception of nature and the environment was put in place by processes of colonialism:** The passage explicitly discusses how European colonialism shaped perceptions and attitudes towards nature and the environment.
4. **The history of climate change is deeply intertwined with the history of colonialism:** Ghosh's book, as described in the passage, traces the climate crisis back to the start of European colonialism, indicating a deep interconnection.

11. 2 Question Explanation: Question 11 asks which scenario would make the reviewer's use of "who" for Gaia inappropriate. The question assesses the reader's understanding of the personification of Gaia in the context of the passage and Ghosh's perspective.

Correct Answer:

2. **Modern western science discovers new evidence for the Earth being an inanimate object.**
   If modern western science were to provide new evidence that Earth is an inanimate object, the use of "who" for Gaia would be inappropriate, as "who" is typically used for living entities or those with agency. The passage personifies Earth as Gaia, a living entity that reacts to human actions. New scientific evidence contradicting this personification would render the use of "who" incorrect.

Incorrect Answers:

1. **Direct cause-effect relationship between human activities and global climate change:** This does not negate the personification of Gaia; it could even support it.
3. **Non-European societies have perceived the Earth as a non-living source of resources:** The passage focuses on Ghosh's view and the use of "who" for Gaia, not necessarily on how non-European societies perceive Earth.
4. **Ghosh's book has a different title: "The Nutmeg's Revenge":** The title of the book is irrelevant to the appropriateness of using "who" for Gaia.

12. 3 Question Explanation: Question 12 seeks to determine the primary purpose of discussing the colonization of the Banda islands in Ghosh's book. It requires understanding the central theme or message that this historical example serves in the context of the book.

Correct Answer:

3. **To illustrate how colonialism represented and perpetuated the mindset that has led to climate change.**
   The passage suggests that Ghosh uses the colonization of the Banda islands to demonstrate how colonialism established and perpetuated a worldview that views nature as a resource to be exploited. This mindset, according to Ghosh, has significantly contributed to the current climate crisis. The example of the Banda islands serves to highlight the historical roots of this exploitative attitude towards nature.

Incorrect Answers:

1. **Role of crop cultivation in contributing to climate change:** While the passage mentions nutmeg cultivation, it does not suggest that this is the primary purpose of the discussion.
2. **Systemic violence against the colonized:** Although the passage mentions genocide by the Dutch, it is used more to illustrate the broader mindset of exploitation, not just the violence.
4. **First instance of climate change processes:** The passage does not claim that the colonization of the Banda islands marks the historical beginning of climate change processes, but rather uses it to illustrate the colonial mindset that contributes to climate change.

Question Numbers (13 to 16): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

In 2006, the Met [art museum in the US] agreed to return the Euphronios krater, a masterpiece Greek urn that had been a museum draw since 1972. In 2007, the Getty [art museum in the US] agreed to return 40 objects to Italy, including a marble Aphrodite, in the midst of looting scandals. And in December, Sotheby's and a private owner agreed to return an ancient Khmer statue of a warrior, pulled from auction two years before, to Cambodia.

Cultural property, or patrimony, laws limit the transfer of cultural property outside the source country's territory, including outright export prohibitions and national ownership laws. Most art historians, archaeologists, museum officials and policymakers portray cultural property laws in general as invaluable tools for counteracting the ugly legacy of Western cultural imperialism.

During the late 19th and early 20th century — an era former Met director Thomas Hoving called "the age of piracy" — American and European art museums acquired antiquities by hook or by crook, from grave robbers or souvenir collectors, bounty from digs and ancient sites in impoverished but art-rich source countries. Patrimony laws were intended to protect future archaeological discoveries against Western imperialist designs. . . .

I surveyed 90 countries with one or more archaeological sites on UNESCO's World Heritage Site list, and my study shows that in most cases the number of discovered sites diminishes sharply after a country passes a cultural property law. There are 222 archaeological sites listed for those 90 countries. When you look into the history of the sites, you see that all but 21 were discovered before the passage of cultural property laws. . . .

Strict cultural patrimony laws are popular in most countries. But the downside may be that they reduce incentives for foreign governments, nongovernmental organizations and educational institutions to invest in overseas exploration because their efforts will not necessarily be rewarded by opportunities to hold, display and study what is uncovered. To the extent that source countries can fund their own archaeological projects, artifacts and sites may still be discovered. . . . The survey has far-reaching implications. It suggests that source countries, particularly in the developing world, should narrow their cultural property laws so that they can reap the benefits of new archaeological discoveries, which typically increase tourism and enhance cultural pride. This does not mean these nations should abolish restrictions on foreign excavation and foreign claims to artifacts.

China provides an interesting alternative approach for source nations eager for foreign archaeological investment. From 1935 to 2003, China had a restrictive cultural property law that prohibited foreign ownership of Chinese cultural artifacts. In those years, China's most significant archaeological discovery occurred by chance, in 1974, when peasant farmers accidentally uncovered ranks of buried terra cotta warriors, which are part of Emperor Qin's spectacular tomb system.

In 2003, the Chinese government switched course, dropping its cultural property law and embracing collaborative international archaeological research. Since then, China has nominated 11 archaeological sites for inclusion in the World Heritage Site list, including eight in 2013, the most ever for China.

13. Which one of the following statements, if true, would undermine the central idea of the passage?
1. Western countries will have to apologise to countries for looting their cultural property in the past century.
2. Affluent archaeologically-rich source countries can afford to carry out their own excavations.
3. Museums established in economically deprived archaeologically-rich source countries can display the antiques discovered there.
4. UNESCO finances archaeological research in poor, but archaeologically-rich source countries.

14. From the passage we can infer that the author is likely to advise poor, but archaeologically-rich source countries to do all of the following, EXCEPT:
1. adopt China's strategy of dropping its cultural property laws and carrying out archaeological research through international collaboration.
2. allow foreign countries to analyse and exhibit the archaeological finds made in the source country.
3. to find ways to motivate other countries to finance archaeological explorations in their country.
4. fund institutes in other countries to undertake archaeological exploration in the source country reaping the benefits of cutting-edge techniques.

15. Which one of the following statements best expresses the paradox of patrimony laws?
1. They were intended to protect cultural property, but instead resulted in the withholding of national treasure from museums.
2. They were intended to protect cultural property, but instead resulted in the neglect of historical sites.
3. They were aimed at protecting cultural property, but instead reduced new archaeological discoveries.
4. They were aimed at protecting cultural property, but instead reduced business for auctioneers like Sotheby's.

16. It can be inferred from the passage that archaeological sites are considered important by some source countries because they:
1. generate funds for future discoveries.
2. are subject to strict patrimony laws.
3. give a boost to the tourism sector.
4. are a symbol of Western imperialism.

Sol.: For questions 13 to 16:

Passage Explanation

Para 1: The first paragraph highlights significant instances where major art institutions, like the Met and the Getty Museum, agreed to return culturally significant artifacts to their countries of origin. These examples include the Euphronios krater, a Greek urn returned by the Met, and several objects including a marble Aphrodite returned by the Getty Museum. Sotheby's agreement to return an ancient Khmer statue to Cambodia is also mentioned. These instances set the stage for discussing the broader issue of cultural property (or patrimony) laws, which aim to limit the transfer of cultural property outside the source country's territory. This introduction establishes the context for the following discussion on the implications of such laws.

Para 2: The second paragraph delves into the purpose and perceived benefits of cultural property laws. Most art historians, archaeologists, museum officials, and policymakers view these laws as essential tools for counteracting the legacy of Western cultural imperialism. The paragraph provides historical context, referring to the late 19th and early 20th centuries as "the age of piracy," when American and European museums frequently acquired antiquities through questionable means from poorer but art-rich source countries. Patrimony laws emerged as protective measures against such practices, intended to safeguard future archaeological discoveries from similar exploitation.

Para 3: In the third paragraph, the author presents findings from a survey of 90 countries with archaeological sites listed by UNESCO. The survey indicates that the number of discovered sites significantly drops after the implementation of cultural property laws. Of the 222 listed sites, the vast majority were discovered before such laws were enacted. This data suggests that while these laws aim to protect cultural heritage, they may inadvertently hinder new archaeological discoveries by creating barriers to exploration and excavation.

Para 4: The fourth paragraph discusses the potential downside of strict cultural property laws, particularly how they might reduce incentives for foreign investment in archaeological exploration. While these laws are popular and aim to protect heritage, their strictness can discourage international collaboration and investment in uncovering new sites. The author suggests that countries, especially those in the developing world, should consider narrowing their cultural property laws to encourage new discoveries, which could lead to increased tourism and cultural pride. The paragraph concludes with the example of China, which revised its restrictive cultural property law in 2003, leading to an increase in international archaeological collaboration and the nomination of several new sites for UNESCO's World Heritage list. This example is used to illustrate a more balanced approach to managing cultural heritage and archaeological exploration.

13. 4 Question Explanation: Question 13 asks which statement, if true, would undermine the central idea of the passage. This requires identifying a scenario that contradicts the main argument or findings presented in the passage regarding cultural property laws and archaeological discoveries.

Correct Answer:

4. UNESCO finances archaeological research in poor, but archaeologically-rich source countries.

If UNESCO actively finances archaeological research in poor countries, this could undermine the passage's central idea that strict cultural property laws diminish incentives for archaeological discoveries. The passage argues that such laws reduce foreign investments in exploration, suggesting a need for funding and collaboration. However, if UNESCO provides significant funding, the negative impact of these laws on discoveries might be lessened or mitigated, challenging the passage's argument.

Incorrect Answers:

1. **Western countries apologizing:** Apologies from Western countries for past looting wouldn't necessarily undermine the idea that cultural property laws have reduced archaeological discoveries.

2. **Affluent source countries affording excavations:** The ability of affluent source countries to fund their excavations does not contradict the passage's central idea regarding the impact of patrimony laws on poorer countries.
3. **Museums in deprived countries displaying antiques:** The establishment of local museums to display artifacts doesn't directly challenge the passage's argument about reduced archaeological discoveries due to patrimony laws.

14. 4 Question Explanation: Question 14 asks what the author is likely to advise poor but archaeologically-rich source countries to do, based on the content of the passage, except for one option that the author wouldn't advise.

Correct Answer:

4. **Fund institutes in other countries to undertake archaeological exploration in the source country, reaping the benefits of cutting-edge techniques.**

   This option is the least likely to be advised by the author, as the passage suggests that the author advocates for easing strict patrimony laws to encourage more archaeological discoveries through international collaboration. It doesn't specifically suggest that source countries should fund institutions in other countries for exploration. The other options align more closely with the passage's content, emphasizing collaborative efforts and modifications to cultural property laws.

Incorrect Answers:

1. **Adopt China's strategy:** The passage cites China as a successful example of easing cultural property laws and embracing international research.
2. **Allow foreign countries to analyze and exhibit finds:** This aligns with the suggestion for more collaborative approaches in archaeology.
3. **Motivate other countries to finance explorations:** Encouraging foreign investments in archaeological projects is consistent with the passage's argument.

15. 3 Question Explanation: Question 15 seeks to identify the best statement that captures the paradox of patrimony laws as presented in the passage.

Correct Answer:

3. **They were aimed at protecting cultural property, but instead reduced new archaeological discoveries.**

   This option directly reflects the paradox discussed in the passage: patrimony laws were intended to protect cultural heritage from exploitation, but the study cited in the passage shows that these laws have actually led to a sharp decrease in new archaeological discoveries. This unintended consequence forms the core of the paradox.

Incorrect Answers:

1. **Withholding national treasure from museums:** The paradox is not about withholding treasures but about the impact on discoveries.
2. **Neglect of historical sites:** The passage doesn't suggest that patrimony laws resulted in site neglect.
4. **Reduced business for auctioneers:** The focus of the paradox is on archaeological discoveries, not auctioneers' business.

16. 3 Question Explanation: Question 16 asks what can be inferred about why some source countries consider archaeological sites important, based on the passage.

Correct Answer:

3. **Give a boost to the tourism sector.**

   The passage suggests that archaeological sites are valued partly because of their potential to boost tourism. This is inferred from the discussion on the benefits of new archaeological discoveries, which typically include increased tourism and enhanced cultural pride.

Incorrect Answers:

1. **Generate funds for future discoveries:** While plausible, the passage doesn't explicitly link site importance to funding future discoveries.
2. **Subject to strict patrimony laws:** The importance of sites isn't directly attributed to the existence of patrimony laws.
4. **Symbol of Western imperialism:** The passage discusses Western imperialism in the context of looting and exploitation, not as a reason for the importance of sites in source countries.

17. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: Beyond undermining the monopoly of the State on the use of force, armed conflict also creates an environment that can enable organized crime to prosper.

Paragraph: ___**(1)**___. Linkages between illicit arms, organized crime, and armed conflict can reinforce one another while also escalating and prolonging violence and eroding governance.___**(2)**___. Financial gains from crime can lengthen or intensify armed conflicts by creating revenue streams for non-State armed groups (NSAGs).___**(3)**___. In this context, when hostilities cease and parties to a conflict move towards a peaceful resolution, the widespread availability of surplus arms and ammunition can contribute to a situation of 'criminalized peace' that obstructs sustainable peacebuilding efforts.___**(4)**___.

1. Option 4 2. Option 2
3. Option 3 4. Option 1

17. 3

Sol.: Question Explanation:

Sentence to Fit:

"Beyond undermining the monopoly of the State on the use of force, armed conflict also creates an environment that can enable organized crime to prosper."

Paragraph Analysis:

The paragraph discusses the interplay between illicit arms, organized crime, and armed conflict, and their combined effects on violence, governance, and sustainable peacebuilding.

Explanation for Each Blank:

Option 1: Placing the sentence here would start the paragraph by immediately discussing the impact of armed conflict on enabling organized crime, without first establishing the context of the linkages between illicit arms, organized crime, and armed conflict. It's important to set this context before delving into specific impacts like the growth of organized crime.

Option 2: Inserting the sentence here disrupts the flow. The paragraph first needs to establish the linkages and then illustrate how they reinforce each other, which is what the given sentence does. Placing it here would prematurely introduce the consequences before establishing the foundational linkages.

Option 3: Here, the sentence fits well. It expands upon the initial statement of linkages between arms, crime, and conflict by explaining a specific consequence of armed conflict - the creation of an environment conducive to organized crime. This placement maintains the logical flow: from stating a problem (linkages) to detailing its implications (enabling organized crime).

Option 4: Placing the sentence at the end would disrupt the paragraph's conclusion about the transition from armed conflict to a 'criminalized peace.' It's important for the concluding part to focus on the post-conflict challenges rather than reintroducing the concept of organized crime's prosperity.

Correct Answer:

Correct Placement and Rationale:

Option 3 is the correct placement. The sentence logically follows the establishment of the linkages between illicit arms, organized crime, and armed conflict and precedes the discussion of the financial gains from crime.

It serves as a bridge between identifying the problem (the linkages) and exploring one of its specific consequences (financial gains for non-State armed groups), maintaining a coherent flow in the paragraph's narrative.

18. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: For theoretical purposes, arguments may be considered as freestanding entities, abstracted from their contexts of use in actual human activities.

Paragraph: ___**(1)**___. An argument can be defined as a complex symbolic structure where some parts, known as the premises, offer support to another part, the conclusion. Alternatively, an argument can be viewed as a complex speech act consisting of one or more acts of premising (which assert propositions in favor of the conclusion), an act of concluding, and a stated or implicit marker ("hence", "therefore") that indicates that the conclusion follows from the premises.___**(2)**___. The relation of support between premises and conclusion can be cashed out in different ways: the premises may guarantee the truth of the conclusion, or make its truth more probable; the premises may imply the conclusion; the premises may make the conclusion more acceptable (or assertible).___**(3)**___. But depending on one's explanatory goals, there is also much to be gained from considering arguments as they in fact occur in human communicative practices.___**(4)**___.

1. Option 1	2. Option 4
3. Option 3	4. Option 2

18. 3

Sol.: Question 18 Explanation

Sentence to Fit:

"For theoretical purposes, arguments may be considered as freestanding entities, abstracted from their contexts of use in actual human activities."

Paragraph Analysis:

The paragraph focuses on defining an argument and exploring different aspects of how arguments function, both in theory and in practical human communication.

Explanation for Each Blank:

Option 1: Starting the paragraph with this sentence would prematurely introduce the concept of arguments as theoretical constructs before defining what an argument is. The foundation of what constitutes an argument should be established first.

Option 2: This placement disrupts the explanation of how an argument can be viewed and its components. It's essential to fully articulate the structure of an argument before contrasting its theoretical and practical aspects.

Option 3: Here, the sentence fits well. It provides a contrast to the detailed explanation of an argument's structure by introducing the idea of considering arguments in a theoretical context, separate from their practical use.

Option 4: Placing the sentence at the end would not fit well because the paragraph is concluding with the notion of gaining insights from practical communication. The sentence about theoretical abstraction would be better placed before this final point.

Correct Answer:

Correct Placement and Rationale:

Option 3 is the correct placement. The sentence logically follows the detailed explanation of an argument's structure and components. It introduces the idea of considering arguments in a theoretical context, setting up a contrast with the subsequent point about the benefits of examining arguments as they occur in real-world communication. This placement maintains a coherent flow and logical progression in the paragraph's discussion.

19. Five jumbled up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.

1. Although hard skills have traditionally ruled the roost, some companies are moving away from choosing prospective hires based on technical abilities alone.
2. Companies are shaking off the old definition of an ideal candidate and ditching the idea of looking for the singularly perfect candidate altogether.
3. Now, some job descriptions are frequently asking for candidates to demonstrate soft skills, such as leadership or teamwork.
4. That's not to say that practical know-how is no longer required – some jobs still call for highly specific expertise
5. The move towards prioritising soft skills "is a natural response to three years of the pandemic" says a senior recruiter at Cenlar FSB.

19. 2

Sol.: Analysis of Question

Sentences:

1. Although hard skills have traditionally ruled the roost, some companies are moving away from choosing
2. Companies are shaking off the old definition of an ideal candidate and ditching the idea of looking for the singularly perfect candidate altogether.
3. Now, some job descriptions are frequently asking for candidates to demonstrate soft skills, such as leadership or teamwork.
4. That's not to say that practical know-how is no longer required – some jobs still call for highly specific expertise.
5. The move towards prioritising soft skills "is a natural response to three years of the pandemic" says a senior recruiter at Cenlar FSB.

Logical Flow and Odd Sentence:

- Sentence 1 introduces the shift in hiring practices, moving from hard skills to considering other factors.
- Sentence 3 further explains what the other factors are, specifically mentioning soft skills like leadership and teamwork.
- Sentence 4 provides a balance, noting that while there is this shift, hard skills are still important in some jobs.
- Sentence 5 contextualizes the shift as a response to the pandemic.

Correct Answer:

Sentence **2** is the odd one out. While it talks about changing perceptions of the ideal candidate, it does not directly connect to the specific shift from hard to soft skills or the pandemic's influence on this trend. It's more about a general change in the mindset of companies, whereas the other sentences focus on the specifics of this change.

20. Five jumbled up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.

1. Boa Senior, who lived through the 2004 tsunami, the Japanese occupation and diseases brought by British settlers, was the last native of the island chain who was fluent in Bo.
2. The indigenous population has been steadily collapsing since the island chain was colonised by British settlers in 1858 and used for most of the following 100 years as a colonial penal colony.
3. Taking its name from a now-extinct tribe, Bo is one of the 10 Great Andamanese languages, which are thought to date back to pre-Neolithic human settlement of south-east Asia.

4. The last speaker of an ancient tribal language has died in the Andaman Islands, breaking a 65,000-year link to one of the world's oldest cultures.
5. Though the language has been closely studied by researchers of linguistic history, Boa Senior spent the last few years of her life unable to converse with anyone in her mother tongue.

20. 2

Sol.: Analysis of Question

Sentences:

1. Boa Senior, who lived through the 2004 tsunami, the Japanese occupation and diseases brought by British settlers, was the last native of the island chain who was fluent in Bo.
2. The indigenous population has been steadily collapsing since the island chain was colonised by British settlers in 1858 and used for most of the following 100 years as a colonial penal colony.
3. Taking its name from a now-extinct tribe, Bo is one of the 10 Great Andamanese languages, which are thought to date back to pre-Neolithic human settlement of south-east Asia.
4. The last speaker of an ancient tribal language has died in the Andaman Islands, breaking a 65,000-year link to one of the world's oldest cultures.
5. Though the language has been closely studied by researchers of linguistic history, Boa Senior spent the last few years of her life unable to converse with anyone in her mother tongue.

Logical Flow and Odd Sentence:

- Sentence 4 introduces the main event: the death of the last speaker of an ancient language.
- Sentence 1 provides specific information about this last speaker, Boa Senior, and her unique experiences.
- Sentence 3 gives background on the language Bo, linking it to an ancient tribe and its historical significance.
- Sentence 5 further elaborates on Boa Senior's situation, emphasizing the loss of the language's active use.

Correct Answer:

Sentence **2** is the odd one out. It discusses the broader historical context of the indigenous population's decline due to colonization but does not directly tie into the specific narrative about Boa Senior and the Bo language's extinction. The other sentences focus more directly on the language and its last speaker.

21. The four sentences (labelled 1, 2, 3 and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.

1. Veena Sahajwalla, a materials scientist at the University of New South Wales, believes there is a new way of solving this problem.
2. Her vision is for automated drones and robots to pick out components, put them into a small furnace and smelt them at specific temperatures to extract the metals one by one before they are sent off to manufacturers for reuse.
3. E-waste contains huge quantities of valuable metals, ceramics and plastics that could be salvaged and recycled, although currently not enough of it is.
4. She plans to build microfactories that can tease apart the tangle of materials in mobile phones, computers and other e-waste.

21. 3142

Sol.: Sentence Analysis:

1. Veena Sahajwalla, a materials scientist at the University of New South Wales, believes there is a new way of solving this problem.
2. Her vision is for automated drones and robots to pick out components, put them into a small furnace and smelt them at specific temperatures to extract the metals one by one before they are sent off to manufacturers for reuse.
3. E-waste contains huge quantities of valuable metals, ceramics, and plastics that could be salvaged and recycled, although currently not enough of it is.
4. She plans to build microfactories that can tease apart the tangle of materials in mobile phones, computers, and other e-waste.

Detailed Sequence Rationale:

- **Starting Statement (3):** The paragraph should start with a general statement about the problem or context. Sentence 3 introduces the issue of e-waste and its potential for recycling, which sets the stage for discussing a solution.
- **Next Statement (1):** Following the introduction of the problem, we need to introduce the person who proposes a solution. Sentence 1 introduces Veena Sahajwalla and her belief in a new solution to the e-waste problem, linking directly to the context set in sentence 3.
- **Subsequent Statement (4):** After establishing Sahajwalla's involvement, the paragraph should detail her specific plan. Sentence 4 explains her idea of building microfactories to process e-waste, building on the introduction in sentence 1.
- **Concluding Statement (2):** The final sentence should provide more specific details of the proposed solution. Sentence 2 elaborates on how the microfactories would function, using drones and robots for recycling, which is a natural progression from sentence 4's introduction of the microfactories concept.

22. The four sentences (labelled 1, 2, 3 and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.

1. Centuries later formal learning is still mostly based on reading, even with the widespread use of other possible education-affecting technologies such as film, radio, and television.
2. One of the immediate and recognisable impacts of the printing press was on how people learned; in the scribal culture it primarily involved listening, so memorization was paramount.
3. The transformation of learners from listeners to readers was a complex social and cultural phenomenon, and it was not until the industrial era that the concept of universal literacy took root.
4. The printing press shifted the learning process, as listening and memorisation gradually gave way to reading

22. 2431

Sol.: Sentence Analysis:

1. Centuries later formal learning is still mostly based on reading, even with the widespread use of other possible education-affecting technologies such as film, radio, and television.
2. One of the immediate and recognisable impacts of the printing press was on how people learned; in the scribal culture it primarily involved listening, so memorization was paramount.
3. The transformation of learners from listeners to readers was a complex social and cultural phenomenon, and it was not until the industrial era that the concept of universal literacy took root.
4. The printing press shifted the learning process, as listening and memorization gradually gave way to reading and learning no longer required the presence of a mentor; it could be done privately.

Detailed Sequence Rationale:

- **Starting Statement (2):** The paragraph should begin with historical context. Sentence 2 introduces the impact of the printing press on learning, shifting from a listening-based culture to one more focused on reading.
- **Next Statement (4):** Following the introduction of the printing press's impact, it is logical to explain how exactly the learning process shifted. Sentence 4 details this shift, describing the move from listening and memorization to independent reading.
- **Subsequent Statement (3):** After establishing the shift, the paragraph should explore its broader implications. Sentence 3 talks about the transformation of learners and the eventual rise of universal literacy, building on the changes described in sentence 4.
- **Concluding Statement (1):** The final sentence should provide a modern perspective or conclusion. Sentence 1 reflects on the current state of formal learning, still predominantly based on reading despite the availability of other technologies, connecting back to the historical shift initiated by the printing press.

23. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Gradually, life for the island's birds is improving. Antarctic prions and white-headed petrels, which also nest in burrows, had managed to cling on in some sites while pests were on the island. Their numbers are now increasing. "It's fantastic and so exciting," Shaw says. As birds return to breed, they also poo. This adds nutrients to the soil, which in turn helps the plants to grow back stronger. Tall plants then help burrowing birds hide from predatory skuas. "It's this wonderful feedback loop," Shaw says. Today, the "pretty paddock" that Houghton first experienced has been transformed. "The tussock is over your head, and you're dodging all these penguin tunnels," she says. The orchids and tiny herb that had been protected by fencing have started turning up all over the place.

1. There is a huge positive transformation of the ecosystem of the island when brought under environmental protection.
2. In the absence of pests, life on the island is now protected, and there has been a revival of a variety of birds and plants.
3. Flowering plants, herbs and birds are now being protected on this wonderful Antarctic island.
4. There is an increasing number of predatory birds and plants on the island despite the presence of pests which is a positive development.

23. 2

Sol.: Analysis of Question

Passage Analysis

Sentence 1: Indicates that the bird population on the island is recovering.

Sentence 2: Birds nesting in burrows had survived despite pests and are now increasing in numbers.

Sentence 3: The return of birds is exciting; their droppings add nutrients to the soil.

Sentence 4: The nutrient-rich soil helps plants grow stronger, which in turn assists the burrowing birds.

Sentence 5: Describes the positive ecological changes, with taller plants and a proliferation of wildlife.

Main Points

- The bird population is increasing.
- Bird droppings are enriching the soil.
- The enriched soil is aiding plant growth.
- This creates a positive ecological cycle, benefiting both birds and plants.

Correct Answer: 2

"In the absence of pests, life on the island is now protected, and there has been a revival of a variety of birds and plants."

This summary accurately captures the essence of the passage: the improvement in the ecosystem due to the absence of pests, leading to the revival of birds and plants.

Incorrect Answers:

1. **"Huge positive transformation...under environmental protection":** Misleading as it suggests a broader environmental protection scope rather than focusing on the specific ecological feedback loop described.
3. **"Flowering plants, herbs, and birds are now being protected":** Overemphasizes protection, missing the focus on the ecological cycle and the reasons behind the revival.
4. **"Increasing number of predatory birds and plants despite pests":** Incorrect as it mentions the presence of pests, which the passage does not imply, and mischaracterizes the type of birds and plants involved.

24. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

The weight of society's expectations is hardly a new phenomenon but it has become particularly draining over recent decades, perhaps because expectations themselves are so multifarious and contradictory. The perfectionism of the 1950s was rooted in the norms of mass culture and captured in famous advertising images of the ideal white American family that now seem self-satirising. In that era, perfectionism meant seamlessly conforming to values, behaviour and appearance: chiselled confidence for men, demure graciousness for women. The perfectionist was under pressure to look like everyone else, only more so. The perfectionists of today, by contrast, feel an obligation to stand out through their idiosyncratic style and wit if they are to gain a foothold in the attention economy.

1. The image of perfectionism is reflected in and perpetuated by the media; and people do their best to adhere to these ideals.
2. Though long-standing, the pressure to appear perfect and thereby attract attention, has evolved over time from one of conformism to one of non-conformism.
3. The desire to attract attention is so deep-rooted in individual consciousness that people are willing to go to any lengths to achieve it.
4. The pressure to appear perfect has been the cause of tension and conflict because the idea itself has been in a state of flux and hard to define.

24. 2

Sol.: Analysis of Question

Passage Analysis

Sentence 1: Discusses the weight of societal expectations and notes its intensification in recent decades due to contradictory expectations.

Sentence 2: Describes the 1950s' perfectionism, rooted in mass culture's norms.

Sentence 3: Explains how perfectionism then was about conforming to societal values and appearance.

Sentence 4: Contrasts this with today's perfectionism, where standing out is key to attracting attention.

Main Points

- Societal expectations have intensified recently.
- 1950s' perfectionism was about conforming to norms.
- Today's perfectionism is about standing out and individuality.

Correct Answer: 2

"Though long-standing, the pressure to appear perfect and thereby attract attention, has evolved over time from one of conformism to one of non-conformism."

This summary captures the essence of the passage: the evolution of societal perfectionism from conforming to norms to emphasizing individuality.

Incorrect Answers:

1. **"Image of perfectionism...adhere to these ideals":** Too general and does not capture the evolution of the concept of perfectionism over time.
3. **"Desire to attract attention...willing to go to any lengths":** Overemphasizes the desire for attention without reflecting the passage's focus on the evolution of societal expectations.
4. **"Pressure to appear perfect...state of flux and hard to define":** This answer focuses more on the conflict and indefinability, which is not the central theme of the passage.

Section II: DI & LR

Question Numbers (1 to 5): An air conditioner (AC) company has four dealers – D1, D2, D3 and D4 in a city. It is evaluating sales performances of these dealers. The company sells two variants of ACs – Window and Split. Both these variants can be either Inverter type or Non-inverter type. It is known that of the total number of ACs sold in the city, 25% were of Window variant, while the rest were of Split variant. Among the Inverter ACs sold, 20% were of Window variant. The following information is also known:

1. Every dealer sold at least two window ACs.
2. D1 sold 13 inverter ACs, while D3 sold 5 Non-inverter ACs.
3. A total of six Window Non-inverter ACs and 36 Split Inverter ACs were sold in the city.
4. The number of Split ACs sold by D1 was twice the number of Window ACs sold by it.
5. D3 and D4 sold an equal number of Window ACs and this number was one-third of the number of similar ACs sold by D2.
6. D2 and D3 were the only ones who sold Window Non-inverter ACs. The number of these ACs sold by D2 was twice the number of these ACs sold by D3.
7. D3 and D4 sold an equal number of Split Inverter ACs. This number was half the number of similar ACs sold by D2.

1. How many Split Inverter ACs did D2 sell?

2. What percentage of ACs sold were of Non-inverter type?

1. 20.00%
2. 25.00%
3. 75.00%
4. 33.33%

3. What was the total number of ACs sold by D2 and D4?

4. Which of the following statements is necessarily false?

1. D1 and D3 together sold more ACs as compared to D2 and D4 together.
2. D4 sold more Split ACs as compared to D3.
3. D2 sold the highest number of ACs.
4. D1 and D3 sold an equal number of Split ACs.

5. If D3 and D4 sold an equal number of ACs, then what was the number of Non-inverter ACs sold by D2?

1. 5
2. 7
3. 6
4. 4

Sol.: For questions 1 to 5:
Step 1:
According to the given information let us create a table and fill it as we go through the given conditions.
From condition (1), the value of a is at least 8 as each dealer sold at least 2 window ACs.
From condition (2), D1 sold 13 inverter ACs and D3 sold 5 Non-inverter ACs.

	Window			Split			Overall		
Dealer	**Inverter**	**Non-inverter**	**Total**	**Inverter**	**Non-inverter**	**Total**	**Inverter**	**Non-inverter**	**Total**
D1							13		
D2									
D3								5	
D4									
Total	b		a	4b		3a	5b		4a

From condition (3), Window-Non-inverter ACs = 6 and Split-Inverter ACs = 36

$\Rightarrow$ 4b = 36 $\Rightarrow$ b = 9 $\Rightarrow$ a = b + 6 = 15 $\Rightarrow$ 4a = 60 (overall total); 3a = 45

$\Rightarrow$ Total N = 60 - 45 = 15

From condition (4), if D1 sold c number of Window ACs, then D1 sold 2c number of Split ACs $\Rightarrow$ Total for D1 = 3c

From condition (5), Total number of Window ACs sold by D3 = D4 = x (say) $\Rightarrow$ D2 sold 3x Window ACs

$\Rightarrow$ c + 5x = 15 $\Rightarrow$ (c, x) = {(0, 3), (5, 2)}

[Here (0, 3) is discarded as every dealer sold at least 2 Window ACs.]

$\Rightarrow$ x = 2 $\Rightarrow$ 3x = 6

From condition (6), Window-Non-inverter ACs sold by D3 = y (say) $\Rightarrow$ Window-Non-inverter ACs sold by D2 = 2y

$\Rightarrow$ 2y + y = 6 $\Rightarrow$ y = 2 (as the other two dealers do not sell Window-Non-inverter ACs)

Step 2:

From, the above we can also find the number of Window-Inverter ACs sold by each dealer.

Now, D3 sold 5 Non-inverter ACs out of which 2 were Window ACs $\Rightarrow$ D3 sold 3 Split ACs.

From condition (7), Let Split-Inverter ACs sold by D3 = D4 = z (say) $\Rightarrow$ D2 sold 2z Split-Inverter ACs.

Now, Split-Inverter ACs sold by D1 = Total – Window = 13 – 5 = 8

$\Rightarrow$ 8 + 4z = 36 $\Rightarrow$ z = 7

Total number of Split ACs sold by D3 = 7 + 3 = 10

Total number of ACs sold by D3 = 7 + 5 = 12

Total number of Split-Non-inverter ACs sold by D1 = 2 – 0 = 2

	Window			Split			Overall		
Dealer	**Inverter**	**Non-inverter**	**Total**	**Inverter**	**Non-inverter**	**Total**	**Inverter**	**Non-inverter**	**Total**
D1	5 – 0 = 5	0	c = 5	13 – 5 = 8		2c = 10	13	15 – 13 = 2	3c = 15
D2	6 – 4 = 2	2y = 4	3x = 6	2z = 14					
D3	2 – 2 = 0	y = 2	x = 2	z = 7	5 - 2 = 3	7 + 3 = 10	7	5	7 + 5 = 12
D4	2 – 0 = 2	0	x = 2	z = 7					
Total	b = 9	6	a = 15	4b = 36	45 – 36 = 9	3a = 45	5b = 45	60 – 45 = 15	4a = 60

1. 14 Total number of Split Inverter ACs sold by D2 = 14

2. 2 Total number of ACs sold = 60; Total number of Non-inverter ACs sold = 15
Hence, required percentage = 15%.

3. 33 Total number of ACs sold by D2 and D4 = 60 – (15 + 12) = 33.

4. 1 D1 and D3 together sold 27 ACs whereas D2 and D4 sold 33 ACs. Hence, option (1) is necessarily false.
All the other statements are not necessarily false. Hence, the correct answer is option (1).

5. 1 If D3 and D4 sold equal number of ACs, then the total number of ACs sold by D2 = 60 – (15 + 12 + 12) = 21.
Total number of Non-inverter ACs sold by D2 = 21 – 16 = 5.

Question Numbers (6 to 10): In a coaching class, some students register online, and some others register offline. No student registers both online and offline; hence the total registration number is the sum of online and offline registrations. The following facts and table pertain to these registration numbers for the five months – January to May of 2023. The table shows the minimum, maximum, median registration numbers of these five months, separately for online, offline and total number of registrations. The following additional facts are known.

1. In every month, both online and offline registration numbers were multiples of 10.
2. In January, the number of offline registrations was twice that of online registrations.
3. In April, the number of online registrations was twice that of offline registrations.
4. The number of online registrations in March was the same as the number of offline registrations in February.
5. The number of online registrations was the largest in May.

	Minimum	**Maximum**	**Median**
Online	40	100	80
Offline	30	80	50
Total	110	130	120

6. What was the total number of registrations in April?

7. What was the number of online registrations in January?

8. Which of the following statements can be true?
I. The number of offline registrations was the smallest in May.
II. The total number of registrations was the smallest in February.

1. Neither I nor II
2. Only II
3. Both I and II
4. Only I

9. What best can be concluded about the number of offline registrations in February?
1. 50
2. 30 or 50 or 80
3. 80
4. 50 or 80

10. Which pair of months definitely had the same total number of registrations?
I. January and April
II. February and May

1. Neither I nor II
2. Only I
3. Both I and II
4. Only II

Sol.: For questions 6 to 10:

Step 1:

According to the given information:

The number of registrations during the 5 months when arranged in order will be:

Online : 40 _ 80 _ 100

Offline : 30 _ 50 _ 80

Total : 110 _ 120 _ 130

So we can see that the total number of registrations can be one of the following 4 choices:

{110, (110/120), 120, (120/130), 130}

From (2), In January, online = x; offline = 2x; total = 3x

Since the total has to be a multiple of 3, the only possible number is 120.

$\Rightarrow$ In January, online = 40; offline = 80; total = 120.

From (3) In April, online = 2y; offline = y; total = 3y

⇒ In April, online = 80; offline = 40; total = 120.

From (5) online (May) = 100 (maximum)

⇒ Total for May can only be 130 ⇒ offline (May) = 30.

From (4) online (Mar) = offline (Feb) = z (say) [Note that z can take values 50 or 60]

Step 2:

If offline(Mar) = 50, then z can take value 60 and March total = 110.

But in this case Online (March) will have to be ≥ 80 (as 80 is the median), then total will become more than 130. Hence, we discard this case.

If z = 50, then online(Feb) can be any value among {80, 90, 100},

As total has to be between 110 and 130, only 80 is a possible value for online (Feb).

⇒ Offline (March) = 60

	January	February	March	April	May
Online	40	80	50	80	100
Offline	80	50	60	40	30
Total	120	130	110	120	130

6. 120 Total number of registrations in April = 120

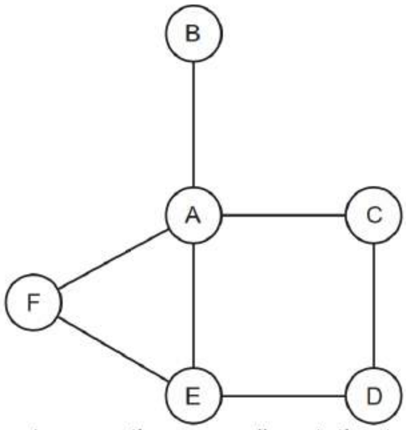
7. 40 Online registrations in January = 40

8. 4 The number of offline registrations in May was the smallest, is true.
Total number of registrations in February was the smallest, is false.
Hence, only statement I is true.

9. 1 We can see from the table that the number of offline registrations in February was 50.

10. 3 It can be observed that January and April had 120 total registrations each and February and May had 130 total registrations each. Hence, both I and II are correct.

Question Numbers (11 to 15): A, B, C, D, E and F are the six police stations in an area, which are connected by streets as shown below. Four teams – Team 1, Team 2, Team 3 and Team 4 – patrol these streets continuously between 09:00 hrs. and 12:00 hrs. each day.



The teams need 30 minutes to cross a street connecting one police station to another. All four teams start from Station A at 09:00 hrs. and must return to Station A by 12:00 hrs. They can also pass via Station A at any point on their journeys. The following facts are known.

1. None of the streets has more than one team traveling along it in any direction at any point in time.
2. Teams 2 and 3 are the only ones in stations E and D respectively at 10:00 hrs.
3. Teams 1 and 3 are the only ones in station E at 10:30 hrs.
4. Teams 1 and 4 are the only ones in stations B and E respectively at 11:30 hrs.
5. Team 1 and Team 4 are the only teams that patrol the street connecting stations A and E.
6. Team 4 never passes through Stations B, D or F.

11. Which one among the following stations is visited the largest number of times?

1. Station C
2. Station E
3. Station D
4. Station F

12. How many times do the teams pass through Station B in a day?

13. Which team patrols the street connecting Stations D and E at 10:15 hrs?

1. Team 2
2. Team 4
3. Team 3
4. Team 1

14. How many times does Team 4 pass through Station E in a day?

15. How many teams pass through Station C in a day?

1. 2
2. 4
3. 1
4. 3

Sol.: For questions 11 to 15:

Step 1:

All four teams will be at station A at 9:00 pm and at 12:00 am.

From condition (1), all 4 teams will travel from station A towards distinct stations and to station A from distinct stations at 9:30 and at 11:30 respectively. (Note that these stations can be B, C, E and F only).

From station B there is only one route and that goes to A.

From condition (2), T2 and T3 are the only ones at E and D respectively at 10:30 ⇒ T1 and T4 cannot be at stations E and D at 10:30.

From condition (3), T1 and T3 are the only ones at station E at 10:30, so T2 and T4 cannot be at station E at 10:30.

From condition (4), T1 and T4 are the only ones at B and E respectively at 11:30, so T2 and T3 cannot be at stations B or E at 11:30.

We can fill the above information in a table as follows:

Team	9:00	9:30	10:00	10:30	11:00	11:30	12:00
T1	A			E		B	A
T2	A		E				A
T3	A		D	E			A
T4	A					E	A

Step 2:

From condition (5), T1 and T4 are the only teams that patrol A-E, so T2 and T3 cannot take route A-E.

From condition (6), T4 cannot pass stations B, D and F so it can go only to stations A, C and E.

Since T1 was at B at 11:30 ⇒ T1 was at A at 11:00.

Since T4 can only be at stations A, C and E

⇒ T4 was at A at 11:00.

⇒ T4 was at C or E at 10:30, also from condition (3), T4 was not at E at 10:30 ⇒ T4 was at C at 10:30.

From condition (2), we know that at 10:00 T4 was not at E ⇒ T4 was at A at 10:00.

At 9:30, T4 could be at E or C.

From condition (2), T3 can go from A to D between 9:00 and 10:00 via C or via E, but from condition (5), T2 and T3 cannot take route A-E, so the only route possible for T3 is A-C-D

⇒ T3 was at C at 9:30 ⇒ T4 was at E at 9:30.

The only possible route for T2 between 9:00 and 10:00 is A-F-E as all the other routes from A to E will take more than one hour.

⇒ T1 will be at B at 9:30 ⇒ T1 is at A at 10:00.

Between 10:30 and 11:00, T1 is on route E-A so T3 cannot be on the same route. T3 has to reach station A at 12:00 and all teams are at distinct stations at 11:30.

⇒ T3 will go via E-D-C-A between 10:30 and 12:00.

⇒ T2 will be at F at 11:30

At 10:00 T2 is at E so it can be at F, A or D at 10:30, but A-E is being used by T1 during 10:00 to 10:30 so T2 cannot go on that route. Also, T3 is on route D-E so T2 cannot use that route too.

⇒ T2 will be at F at 10:30 ⇒ T2 will be either at E or A at 11:00.

Hence, the final table will be as follows:

Team	9:00	9:30	10:00	10:30	11:00	11:30	12:00
T1	A	B	A	E	A	B	A
T2	A	F	E	F	E / A	F	A
T3	A	C	D	E	D	C	A
T4	A	E	A	C	A	E	A

11. 2 From the table we can see that station D was visited twice, stations C and F were visited thrice and station E was visited either 5 or 6 times. Hence, station E was visited the maximum number of times.

12. 2 The number times the teams pass through station B = 2.

13. 3 The team that is on route D-E at 10:15 is Team 3.

14. 2 Team 4 passes through station E twice.

15. 1 The number of teams that pass through station C = 2.

Question Numbers (16 to 20): There are only three female students – Amala, Koli and Rini – and only three male students – Biman, Mathew and Shyamal – in a course. The course has two evaluation components, a project and a test. The aggregate score in the course is a weighted average of the two components, with the weights being positive and adding to 1.

The projects are done in groups of two, with each group consisting of a female and a male student. Both the group members obtain the same score in the project.

The following additional facts are known about the scores in the project and the test.

1. The minimum, maximum and the average of both project and test scores were identical – 40, 80 and 60, respectively.
2. The test scores of the students were all multiples of 10; four of them were distinct and the remaining two were equal to the average test scores.
3. Amala's score in the project was double that of Koli in the same, but Koli scored 20 more than Amala in the test. Yet Amala had the highest aggregate score.

4. Shyamal scored the second highest in the test. He scored two more than Koli, but two less than Amala in the aggregate.
5. Biman scored the second lowest in the test and the lowest in the aggregate.
6. Mathew scored more than Rini in the project, but less than her in the test.

16. What was Rini's score in the project?

17. What was the weight of the test component?

1. 0.60
2. 0.50
3. 0.40
4. 0.75

18. What was the maximum aggregate score obtained by the students?

1. 68
2. 80
3. 66
4. 62

19. What was Mathew's score in the test?

20. Which of the following pairs of students were part of the same project team?

(i) Amala and Biman
(ii) Koli and Mathew

1. Only (i)
2. Neither (i) nor (ii)
3. Only (ii)
4. Both (i) and (ii)

Sol.: For questions 16 to 20:

Step 1:

Females in the group : Amala (A), Koli (K), Rini (R)

Males in the group : Biman (B), Mathew (M), Shyamal (S)

Teams of 2 people - one male and one female.

In Project : Min = 40; Max = 80; Average = 60

$\Rightarrow$ Total score = 360

Both team members get the same score in Project.

So Project scores of 6 people = {40, 40, 60, 60, 80, 80}

In Test : Min = 40; Max = 80; Average = 60

$\Rightarrow$ Total score = 360

Two people get 60, One each gets 40 and 80

$\Rightarrow$ remaining two get {50, 70}

From condition (3), Project scores of A and K are 80 and 40 respectively. Since Rini is on a different team, her score will be 60.

Let test scores of A and K be x and x + 20, which can take values (40, 60) or (60, 80).

From condition (4), Test score of S = 70; If aggregate of S = A, then the aggregate scores of K and A are (A – 2) and (A + 2) respectively.

From condition (5), Test score of B = 50

From condition (6), Project score of M = 80 and test score of M is at least 40 (less than Rini) (also 40 is the min score).

Now, if M's test score is > 40 and A's test score is 40, then A's aggregate will not be the highest (violates condition 3). Hence, x = 60 and x + 20 = 80.

Step 2:

Let the weights given to project and test be k and (1 – k).

Using scores of A and K we can write the following two equations:

$80k + 60(1 - k) = A + 2$ …(i)

$40k + 80(1 – k) = A - 2$ ...(ii)

Solving for k we get $k = 0.4$.

Using the value of k we can calculate the aggregate scores for A, K and S.

Hence, $A = 66$, $A + 2 = 68$ and $A – 2 = 64$

$\Rightarrow$ Project score of S = 60

The only remaining Project score is B's, which is 40.

Among Test scores we have only 40 and 60 remaining, so from condition (6), w get R's score = 60 and M's score = 40.

Now, we have all the project and test scores.

Hence, we can make the table as follows:

Person	Project (0.4)	Test (0.6)	Aggregate
Amala	80	60	68
Koli	40	80	64
Rini	60	60	60
Biman	40	50	46
Mathew	80	40	56
Shyamal	60	70	66

Based on the project scores there can be the following teams: (A, M), (K, B), (R, S)

16. 60 Rini's project score = 60.

17. 1 Weight given to test scores = 0.6.

18. 1 Maximum aggregate was for Amala and it was 68.

19. 40 Mathew's test score = 40.

20. 2 The teams were (A, M), K, B) and (R, S).
Hence, neither (i) nor (ii) is correct.

Section III: QA

1. For a real number x, if $\frac{1}{2}, \frac{\log_3(2^x-9)}{\log_3 4}$, and $\frac{\log_5\left(2^x+\frac{17}{2}\right)}{\log_5 4}$ are in an arithmetic progression, then the common difference is

1. $\log_4 7$
2. $\log_4\left(\frac{3}{2}\right)$
3. $\log_4\left(\frac{7}{2}\right)$
4. $\log_4\left(\frac{23}{2}\right)$

1. 3

Sol.: Given $\frac{1}{2}, \left[\frac{\log_3\left(2^x-9\right)}{\log_3{}^4}\right]$ and $\frac{\log_5\left(2^x+\frac{17}{2}\right)}{\log_5{}^4}$ are in AP.

$\Rightarrow 2\log_4(2^x-9) = \frac{1}{2}+\log_4\left(2^x+\frac{17}{2}\right)$

$\Rightarrow (2^x-9)^2 = 2\left(2^x+\frac{17}{2}\right)$

Let $2^x = a \Rightarrow (a-9)^2 = 2a + 17$

$\Rightarrow a^2 - 2a + 64 = 0 \Rightarrow a = 4, 16$

Since $2^x > 9$ $\therefore$ we discard $a = 4$

So $a = 16$ is the only possible value.

$\Rightarrow 2^x = 16 \Rightarrow x = 4$

So the common difference of the AP

$= \log_4^7 - \log_4^2 = \log_4^{\left(\frac{7}{2}\right)}$.

2. For some real numbers a and b, the system of equations $x + y = 4$ and $(a + 5)x + (b - 15)y = 8b$ has infinitely many solutions for x and y. Then, the maximum possible value of ab is

1. 15
2. 33
3. 55
4. 25

2. 2

Sol.: For some real numbers a & b.

$x + y = 4$ ...(1)

$(a + 5)x + (b^2 - 15)y = 8b$...(2)

For infinitely many solutions.

$\Rightarrow \frac{a+5}{1} = \frac{b^2-5}{1} = \frac{2b}{1}$

$\Rightarrow 2b = b^2 - 15 \Rightarrow (b-5)(b+3) = 0$

$\Rightarrow b = 5, -3$

Also, $a + 5 = 2b$ or $a = 2b - 5$

$\Rightarrow a = 5, -11$

Maximum value of $ab = (-3)(-11) = 33$.

3. If x is a positive real number such that $x^8 + \left(\frac{1}{x}\right)^8 = 47$, then the value of $x^9 + \left(\frac{1}{x}\right)^9$ is

1. $36\sqrt{5}$
2. $30\sqrt{5}$
3. $34\sqrt{5}$
4. $40\sqrt{5}$

3. 3

Sol.: $x^8 + \left(\frac{1}{x}\right)^8 = 47$

$\Rightarrow (x^4)^2 + \left(\frac{1}{x^4}\right)^2 + 2.\frac{1}{x^4}.x^4 = 49$

$\Rightarrow x^4 + \frac{1}{x^4} = 7$

$\Rightarrow x^2 + \frac{1}{x^2} = 3$

$\Rightarrow x + \frac{1}{x} = \sqrt{5}$

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

$= \sqrt{5}(3-1) = 2\sqrt{5}$

Now, $x^9 + \frac{1}{x^9} = \left(x^3 + \frac{1}{x^3}\right)\left(x^6 + \frac{1}{x^6} - 1\right)$

$= 2\sqrt{5}(18-1) = 34\sqrt{5}$

[**Note:** $\left(x^3 + \frac{1}{x^3}\right)^2 = x^6 + \frac{1}{x^6} + 2 = 20$

$\Rightarrow x^6 + \frac{1}{x^6} = 20 - 2 = 18.$

4. Let n and m be two positive integers such that there are exactly 41 integers greater than 8^m and less than 8^n, which can be expressed as powers of 2. Then, the smallest possible value of n + m is

1. 42
2. 44
3. 16
4. 14

4. 3

Sol.: Given 8^m < 41 integers < 8^n
2^{3m} < 41 integers < 2^{3n}
41 integers are expressed as power of 2.
$3m - 3m = 42$
$\Rightarrow m - m = 14$
$\Rightarrow 15 - 1 = 14$
Hence, smallest value of $m + n = 15 + 1 = 16$.

5. A quadratic equation $x^2 + bx + c = 0$ has two real roots. If the difference between the reciprocals of the roots is 1/3, and the sum of the reciprocals of the squares of the roots is 5/9, then the largest possible value of (b + c) is

5. 9

Sol.: Let α & β be the roots of
$x^2 + bx + c = 0.$

$$\frac{1}{\alpha}-\frac{1}{\beta}=\frac{1}{3} \quad ....(1)$$

$$\frac{1}{\alpha^2}+\frac{1}{\beta^2}=\frac{5}{9} \quad .... (2)$$

$b + c = -(\alpha+\beta) + \alpha\beta$
$= \alpha\beta - (\alpha+\beta)$
Solving (1), we get

$$\frac{1}{\alpha^2}+\frac{1}{\beta^2}-\frac{2}{\alpha\beta}=\frac{1}{9}$$

$$\Rightarrow \frac{5}{9}-\frac{2}{\alpha\beta}=\frac{1}{9} \Rightarrow \alpha\beta=\frac{9}{2}$$

From (2), $\dfrac{\alpha^2+\beta^2}{\alpha^2\beta^2}=\dfrac{5}{9} \Rightarrow \alpha^2+\beta^2=\dfrac{45}{4}$

$$\Rightarrow \alpha^2+\beta^2+2\alpha\beta=\frac{45}{4}+2\left(\frac{9}{2}\right)$$

$$\Rightarrow (\alpha+\beta)^2=\frac{81}{4} \Rightarrow \alpha+\beta=\pm\frac{9}{2}$$

Hence, maximum value of b + c = $\dfrac{9}{2}-\left(-\dfrac{9}{2}\right)=9.$

6. The sum of the first two natural numbers, each having 15 factors (including 1 and the number itself), is

6. 468

Sol.: Let the number be N_1 and N_2.
Given that they have 15 factors.
Now, $15 = 5 \times 3$
$= (4 + 1)(2 + 1)$
$N_1 = 2^4 \times 3^2 = 144$
$N_2 = 2^2 \times 3^4 = 324$
Hence, sum = 468.

7. Let n be any natural number such that $5^{n-1} < 3^{n+1}$. Then, the least integer value of m that satisfies $3^{n+1} < 2^{n+m}$ for each such n, is

7. 5

Sol.: Let n be any natural number such that
$5^{n-1} < 3^{n+1}$.
The above inequality holds true only for
n = {2, 3, 4, 5}.

Now, $3^{n+1} = 3^6$ for n =5
So $3^6 < 2^{5+m}$
$729 < 2^{5+m}$
Now, $2^9 = 512$ and $2^{10} = 1024$
$\Rightarrow 5 + m \geq 10 \Rightarrow m \geq 5$
Least integer value of m is 5.

8. A boat takes 2 hours to travel downstream a river from port A to port B, and 3 hours to return to port A. Another boat takes a total of 6 hours to travel from port B to port A and return to port B. If the speeds of the boats and the river are constant, then the time, in hours, taken by the slower boat to travel from port A to port B is

1. $12(\sqrt{5}-2)$
2. $3(3+\sqrt{5})$
3. $3(\sqrt{5}-1)$
4. $3(3-\sqrt{5})$

8. 4

Sol.: According to the question,

$$\frac{d}{B+R} = 2 \text{ and } \frac{d}{B-R} = 3 \Rightarrow \frac{B+R}{B-R} = \frac{3}{2} \Rightarrow B = 5R$$

B = 5 km/hr $\Rightarrow$ R = 1 km/h $\Rightarrow$ d = 12 km
Let speed of slower boat be x km /hr.

$$\Rightarrow \frac{12}{x+1} + \frac{12}{x-1} = 6 \Rightarrow x^2 - 4x - 1 = 0$$

$\Rightarrow x = 2 + \sqrt{5}$ (we discard the negative root)

$$t_{A\to B} = \frac{12}{2+\sqrt{5}+1} = \frac{12}{3+\sqrt{5}} = 3\,(3 - \sqrt{5})\text{ hours.}$$

9. The population of a town in 2020 was 100000. The population decreased by y% from the year 2020 to 2021, and increased by x% from the year 2021 to 2022, where x and y are two natural numbers. If population in 2022 was greater than the population in 2020 and the difference between x and y is 10, then the lowest possible population of the town in 2021 was

1. 74000
2. 72000
3. 73000
4. 75000

9. 3

Sol.: 2020 2021 2022

$$100000 \xrightarrow{-y\%} \boxed{} \xrightarrow{+x\%} 100000$$

We know that x > y for population of 2020 and 2022 to be same.
$\Rightarrow x - y = 10 \Rightarrow y = x - 10$
We know that successive percentage of (–y%, x%)

$$= -y + x - \frac{yx}{100} = -(x-10) + x - \frac{x(x-10)}{100}$$

According to the question, the above expression is > 0

$$\Rightarrow 10 - \frac{x(x-10)}{100} > 0 \Rightarrow x(x-10) > 1000$$

Now, $x^2 - 10x - 1000 > 0$ [Note : 37 × 27 = 999]
$\Rightarrow$ Maximum value of x is 37.
and max value of y is (37 – 10) = 27
Hence, minimum population in 2021 = 100000 × 0.73 = 73000.

10. Rahul, Rakshita and Gurmeet, working together, would have taken more than 7 days to finish a job. On the other hand, Rahul and Gurmeet, working together would have taken less than 15 days to finish the job. However, they all worked together for 6 days, followed by Rakshita, who worked alone for 3 more days to finish the job. If Rakshita had worked alone on the job then the number of days she would have taken to finish the job, cannot be

1. 17
2. 21
3. 16
4. 20

10. 2

Sol.: Let Rahul, Rakshita and Gurmeet take a, b and c days to complete the job.

$\Rightarrow \frac{1}{a}+\frac{1}{b}+\frac{1}{c}<\frac{1}{7}$ ...(1)

$\frac{1}{a}+\frac{1}{c}>\frac{1}{15}$ ....(2)

$6\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)+\frac{3}{b} = 1$ ...(3)

Now, from (1) and (3) , we can say

$\frac{3}{b}>1-\frac{6}{7}=\frac{1}{7}\Rightarrow\frac{1}{b}>\frac{1}{21}$

or b < 21 days. [Hence, b = 21 cannot be a possible answer.]

11. There are three persons A, B and C in a room. If a person D joins the room, the average weight of the persons in the room reduces by x kg. Instead of D, if person E joins the room, the average weight of the persons in the room increases by 2x kg. If the weight of E is 12 kg more than that of D, then the value of x is

1. 1.5
2. 0.5
3. 2
4. 1

11. 4

Sol.: Change in average = $\frac{12}{4}$ = 3

$\Rightarrow 2x-(-x) = 3 \Rightarrow x = 1$

Alternately,

	A + B + C	A + B +C + D	A + B + C + E
Average	a	a – x	a + 2x
Total	3a	4a –4x	4a+8x

Difference of E – D = 12x = 12

$\Rightarrow$ x = 1.

12. A merchant purchases a cloth at a rate of Rs.100 per meter and receives 5 cm length of cloth free for every 100 cm length of cloth purchased by him. He sells the same cloth at a rate of Rs.110 per meter but cheats his customers by giving 95 cm length of cloth for every 100 cm length of cloth purchased by the customers. If the merchant provides a 5% discount, the resulting profit earned by him is

1. 9.7%
2. 4.2%
3. 16%
4. 15.5%

12. 4

Sol.: According to the question,
He gets 105cm instead of 100 cm.
He sells for Rs. 110 instead of Rs. 100.
He gives 95 cm instead of 100 cm.
He gives 5% discount.

$$\Rightarrow \frac{SP}{CP} = \frac{105}{100} \times \frac{110}{100} \times \frac{100}{95} \times \frac{95}{100}$$

$$\text{Profit\%} = \frac{(11550 - 10000)}{10000} \times 100 = 15.\ 50\%.$$

13. Anil mixes cocoa with sugar in the ratio 3 : 2 to prepare mixture A, and coffee with sugar in the ratio 7 : 3 to prepare mixture B. He combines mixtures A and B in the ratio 2 : 3 to make a new mixture C. If he mixes C with an equal amount of milk to make a drink, then the percentage of sugar in this drink will be

1. 21
2. 16
3. 17
4. 24

13. 3

Sol.:

	Cocoa	Sugar	Coffee
A	60%	40%	0%
B	0%	30%	70%
In C, A : B = 2 : 3	$2 \times 60 = 120$	$2 \times 40 + 3 \times 30 = 170$	$3 \times 70 = 210$
C	120/5	$\% = \frac{170}{5}$	210/5
	= 24%	= 34%	= 42%

C is mixed with equal volume of milk

$$\Rightarrow \text{Concentration of Sugar} = \frac{34 + 0}{2} = 17\%.$$

14. A fruit seller has a stock of mangoes, bananas and apples with at least one fruit of each type. At the beginning of a day, the number of mangoes make up 40% of his stock. That day, he sells half of the mangoes, 96 bananas and 40% of the apples. At the end of the day, he ends up selling 50% of the fruits. The smallest possible total number of fruits in the stock at the beginning of the day is

14. 340

Sol.:

Total	Mango	Banana	Apple
100x	40x	60x–5y	5y
Sell : 50x	20x	96	2y

50x = 20x + 96 + 2y

$\Rightarrow$ 30x = 96 + 2y ...(1)

Multiply (1) by $\frac{10}{3}$

$$\Rightarrow 100x = 320 + \frac{20y}{3}$$

Put min y = 3 [as y cannot be 0]
$\Rightarrow$ 100x = 320 + 20 = 340
Hence, minimum possible number of fruits at the beginnig = 340.

15. Gautam and Suhani, working together, can finish a job in 20 days. If Gautam does only 60% of his usual work on a day, Suhani must do 150% of her usual work on that day to exactly make up for it. Then, the number of days required by the faster worker to complete the job working alone is

15. 36

Sol.: Let efficiency of Gurmeet and Suhani be G and S per day.
$20\,[G + S] = 20\,[0.6G + 1.5\,S]$
$\Rightarrow 0.4G = 0.5\,S$

$$\Rightarrow \frac{G}{S} = \frac{5}{4} = \frac{5K}{4K}$$

We know that $\frac{1}{5K} + \frac{1}{4K} = \frac{1}{20} \Rightarrow k = 9$
$\Rightarrow$ Suhani is the faster one and she completes the work in $4 \times 9 = 36$ days.

16. The number of coins collected per week by two coin-collectors A and B are in the ratio 3 : 4. If the total number of coins collected by A in 5 weeks is a multiple of 7, and the total number of coins collected by B in 3 weeks is a multiple of 24, then the minimum possible number of coins collected by A in one week is

16. 42

Sol.:

Coins	A	B
per week	3x	4x
5weeks	15x	–
3weeks	–	12x

According to the question :
$15x = 7\,k_1$ ...(1)
$12x = 24\,k_2$ ... (2)
Dividing (1) by (2), we get

$$\frac{15x}{12x} = \frac{7k_1}{24k_2} \Rightarrow \frac{k_1}{k_2} = \frac{30}{7}$$

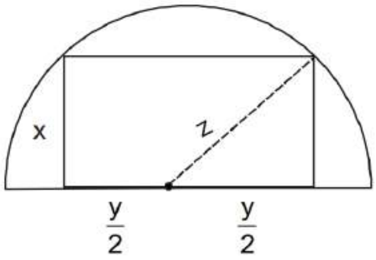
The fraction cannot be reduced faster
hence, Min $(k_1) = 30$
$\Rightarrow 15x = 7 \times 30 = 210$
$\Rightarrow x = 14$ (min)
If x = 14, minimum number of coins with A at the end of 1 week = 3x = 42.

17. A rectangle with the largest possible area is drawn inside a semicircle of radius 2 cm. Then, the ratio of the lengths of the largest to the smallest side of this rectangle is

1. $\sqrt{2} : 1$
2. $\sqrt{5} : 1$
3. $1 : 1$
4. $2 : 1$

17. 4

Sol.:



Let length B breadth of rectangle be y and x.
Area = xy
Moving Pythagoras theorem,

$$x^2 = 2^2 - \left(\frac{y}{2}\right)^2 \Rightarrow x^2 = 16\frac{-y^2}{4}$$

We need to maximize the area of rectangle

$$\Rightarrow \text{ Area} = \left(\frac{\sqrt{16-y^2}}{2}\right)y = \frac{\sqrt{y^2}\sqrt{16-y^2}}{2}$$

Use GM $\le$ AM
Area is maximum when $16 - y^2 = y^2$

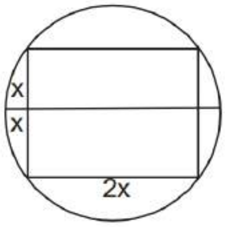
$\Rightarrow\ 2y^2 = 16 = y = 2\ \sqrt{2}$

$\Rightarrow\ x = \sqrt{2}$

$\Rightarrow\ y : x = 2 : 1$

Alternate method : Instead of the largest rectangle in a semicircle, consider a square inside a circle

$\Rightarrow\ y = 2x$



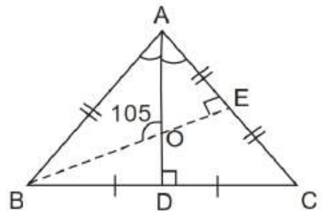
$\Rightarrow\ y : x = 2 : 1.$

18. Let ΔABC be an isosceles triangle such that AB and AC are of equal length. AD is the altitude from A on BC and BE is the altitude from B on AC. If AD and BE intersect at O such that $\angle$AOB = 105°, then AD/BE equals

1. sin 15°
2. cos 15°
3. 2 cos 15°
4. 2 sin 15°

18. 3

Sol.:



In ΔAEO $\angle OAE + \angle OEA = 105°$ (By exterior angle theorem.)

Since $\angle OEA = 90° \Rightarrow \angle OAE = 15°$

Area of $\Delta ABC = \frac{1}{2}$ AD. BC $= \frac{1}{2}$ AC . BE

$$\Rightarrow \frac{AD}{BE} = \frac{AC}{BC} = \frac{AC}{2DC}$$

In ΔADC $\operatorname{cosec} 15° = \frac{AC}{DC}$

$$\Rightarrow \frac{AD}{BE} = \frac{\operatorname{cosec} 15°}{2} = \frac{1}{2\sin 15°}$$

Now, $\frac{1}{2\sin 15°} \times \frac{\cos 15°}{\cos 15°} = \frac{\cos 15°}{\sin 30°} = \frac{\cos 15}{\frac{1}{2}} = 2\cos 15°$.

19. In a regular polygon, any interior angle exceeds the exterior angle by 120 degrees. Then, the number of diagonals of this polygon is

19. 54

Sol.: Given $I - E = 120$ [I : interior angle E : exterior angle]

$I + E = 180$

$\Rightarrow 2I = 300 \Rightarrow I = 150$

$\Rightarrow E = 30$

$\Rightarrow$ Number of sides $= \frac{360}{30} = 12$

Number of diagonals $= \frac{12(12-3)}{2} = 54$.

20. The value of $1+\left(1+\frac{1}{3}\right)\frac{1}{4}+\left(1+\frac{1}{3}+\frac{1}{9}\right)\frac{1}{16}+\left(1+\frac{1}{3}+\frac{1}{9}+\frac{1}{27}\right)\frac{1}{64}+\ldots$, is

1. 15/8
2. 16/11
3. 27/12
4. 15/13

20. 2

Sol.: $1+\left(1+\frac{1}{3}\right)\frac{1}{4}+\left(1+\frac{1}{3}+\frac{1}{9}\right)\frac{1}{16}+\left(1+\frac{1}{3}+\frac{1}{9}+\frac{1}{27}\right)\frac{1}{64}$

Let $\frac{1}{3} = x$ & $\frac{1}{4} = y$

$\Rightarrow$ $S = 1 + (1 + x)y + (1 + x + x^2)\,y^2 + (1 + x + x^2 + x^3)y^3$

$Sy = y + (1 + x)y^2 + (1 + x + x^2)\,y^3 + (1 + x + x^2 + x^3)y^4$

$S - Sy = 1 + xy + x^2y^2 + x^3y^2 + \ldots..$ [GP : $xy < 1$]

$S\,(1 - y) = \frac{1}{1-xy}$ [as $xy = \frac{1}{12} < 1$]

$\Rightarrow$ $S = \frac{1}{(1-y)(1-xy)} = \frac{1}{\frac{3}{4}} \times \frac{1}{\frac{11}{12}} = \frac{16}{11}$

Short cut : Use the first 3 terms only and find the approximate sum and then match with the option.

$1+\frac{4}{3}\times\frac{1}{4}+\frac{13}{144}=\frac{205}{144}\approx 1.42\left(=\frac{16}{11}\right).$

21. Let $a_n = 46 + 8n$ and $b_n = 98 + 4n$ be two sequences for natural numbers $n \le 100$. Then, the sum of all terms common to both the sequences is

1. 14798
2. 14602
3. 14900
4. 15000

21. 3

Sol.: $A_n = 46 + 8_n$; $B_n = 98 + 4_n$ n is the natural number, so $n > 0$.

$A_n = 54, 62, 70 \ldots. 846 \rightarrow 8x + 6$

$B_n = 102, 106, \ldots. 498 \rightarrow 4y + 2$

We can see that the smallest number common to both series.

$8x + 6 = 4y + 2 = 102$

Common terms = {102, 110, 118, …, 494}

Number of terms = $\frac{494-162}{8}+1 = 50$

Hence, required sum = $\frac{50}{2}[102+494] = 14900$.

22. Suppose $f(x, y)$ is a real-valued function such that $f(3x + 2y, 2x - 5y) = 19x$, for all real numbers x and y. The value of x for which $f(x, 2x) = 27$, is

22. 3

Sol.: $f\,(3x + 2y\,,\, 2x - 5y) = 19x$

Let $3x + 2y = a$ & $2x - 5y = b$

$5a = 5(3x + 2y) = 15x + 10\,y$

$2b = 2\,(2x - 5y) = 4x - 10y$

We have to eliminate y.

So $5a + 2b = 19x$

We can say $f\,(a, b) = 5a + 2b$

Now $f\,(x, 2x) = 27$

$\Rightarrow$ $5x + 4x = 27$

$\Rightarrow$ $x = 3$.