

CAT 2023 Slot - III

Section : Verbal Ability

DIRECTIONS for the question: 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.

Q.1) 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?

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

Correct Answer: c

Explanation - Only option c does not relate to why policies seeking to address climate change fail.

The reasons mentioned in options a and d are stated in the last few lines: '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'.

Option b, too, is mentioned: '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...have dominated global intellectual discourse. . . . There are other points of view that we

can hear today if we listen hard enough...'

Q.2) 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*?

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

Correct Answer: d

Explanation - Note the context in which the passage takes the case of the Banda Islands: 'The biggest challenge [*The Nutmeg's Curse* by Amitav 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..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.'

So, the primary purpose of the discussion of the colonisation of the Banda Islands in *The Nutmeg's Curse* is to illustrate how colonialism represented and perpetuated the mindset that has led to climate change.

Q.3) All of the following can be inferred from the reviewer's discussion of *The Nutmeg's Curse*, EXCEPT:

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

Correct Answer: a

Explanation - Option a is the exact opposite of what the passage states. The passage explains how European colonialists influenced the prevalent way of looking at Earth as a 'resource' to exploit. Though there have been challenges to this way of thinking, the passage says, 'the invaders and their myriad backers in the fields of economics, politics, anthropology, philosophy, literature, technology, physics, chemistry, biology have dominated global intellectual discourse.'

Option a cannot be inferred; this is the correct answer choice.
All other options relate to key ideas that can be inferred from the passage.

Q.4) Which one of the following, if true, would make the reviewer's choice of the pronoun "who" for Gaia inappropriate?

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

Correct Answer: c

Explanation - Note the reason stated by the reviewer for the choice of the pronoun "who": '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.'

The reviewer justifies the choice based on the understanding of Earth as a living entity by non-European societies.

So, if option c were true, it would make the reviewer's choice of the pronoun "who" for Gaia inappropriate.

DIRECTIONS for the question: *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.

Q.5) The author refers to the ancient Greek philosophers to:

- a. indicate the various similarities between their thinking and Pinker's conclusions.
- b. reveal gaps in Pinker's discussion of the importance of ethical considerations in rational behaviour.

- c. show how dreams and visions have for centuries influenced subconscious behaviour and pathbreaking inventions.
- d. highlight the influence of their thinking on the development of Pinker's arguments.

Correct Answer: b

Explanation - Easy question. Refer to the lines, "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'.

Option b is the correct choice.

Option c, which might seem close, is actually totally inconsistent because it mentions that dreams and visions have influenced 'pathbreaking inventions', which isn't discussed in the passage at all.

Q.6) The author mentions Friedrich August Kekulé's discovery of the structure of benzene and Wolfgang Amadeus Mozart's symphonies to illustrate the point that:

- a. great innovations across various fields can stem from flashes of intuition and are not always propelled by logical thinking.
- b. unlike the sciences, human achievements in other fields are a mix of logical reasoning and spontaneous epiphanies.
- c. Pinker's conclusions on sequential reasoning are belied by European achievements which, in the past, were more rooted in unconscious bursts of genius.
- d. it is not just the creative arts, but also scientific fields that have benefitted from flashes of creativity.

Correct Answer: a

Explanation - Note the context in which the author mentions Friedrich August Kekulé's discovery of the structure of benzene and Wolfgang Amadeus Mozart's symphonies: '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'.

Here, the author is making the point that great innovations can stem from flashes of intuition and are not always propelled by logical thinking. Option a is the correct choice.

Q.7) According to the author, for Steven Pinker as well as the ancient Greek philosophers, rational thinking involves all of the following EXCEPT:

- a. the belief that the ability to reason logically encompasses an ethical and moral dimension.
- b. an awareness of underlying assumptions in an argument and gaps in one's own knowledge.
- c. the primacy of conscious sequential reasoning as the basis for seminal human achievements.
- d. arriving at independent conclusions irrespective of who is presenting the argument.

Correct Answer: c

Explanation - The passage states that unlike Steven Pinker, whose main focus is on conscious, sequential reasoning, Socrates, while affirming the virtue of conscious, sequential reasoning, also 'attributed many of his most profound insights to dreams and visions'. Option c is the correct answer choice as the views of Pinker and the ancient Greek philosophers differ on this point.

For both Pinker as well as the ancient Greek philosophers, the ability to reason logically encompasses an ethical and moral dimension: '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...'

So, option a is true.

According to the passage, Socrates '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'. So, options b and d are true.

Q.8) The author endorses Steven Pinker's views on the importance of logical reasoning as it:

- a. equips people with the ability to tackle challenging practical problems.
- b. focuses public attention on real issues like development rather than sensational events.
- c. provides a moral compass for resolving important ethical dilemmas.
- d. helps people to gain expertise in statistics and other scientific disciplines.

Correct Answer: a

Explanation - Note the author's comments on Steven Pinker's views on the importance of logical reasoning: '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'.

So, option a is the correct answer choice.

DIRECTIONS for the question: *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.

Q.9) 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:

- a. to find ways to motivate other countries to finance archaeological explorations in their country.
- b. allow foreign countries to analyse and exhibit the archaeological finds made in the source country.
- c. adopt China's strategy of dropping its cultural property laws and carrying out archaeological research through international collaboration.
- d. fund institutes in other countries to undertake archaeological exploration in the source country reaping the benefits of cutting-edge techniques.

Correct Answer: d

Explanation - The author argues that strict cultural patrimony laws reduce incentives for foreign governments, nongovernmental organizations and educational institutions to invest in overseas exploration. So, the author 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.

The author also substantiates this point with the example of China, which has dropped its cultural property law and embraced collaborative international archaeological research, thereby greatly increasing the number of archaeological sites for inclusion in the World Heritage Site list.

Options a, b and c relate to the author's ideas stated in the passage.

The author is unlikely to advise poor source countries to fund institutes in other countries. So, option d is the correct answer choice.

Q.10) It can be inferred from the passage that archaeological sites are considered important by some source countries because they:

- a. give a boost to the tourism sector.
- b. are a symbol of Western imperialism.
- c. generate funds for future discoveries.
- d. are subject to strict patrimony laws.

Correct Answer: a

Explanation - Note the lines, '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'.

So, it can be inferred from the passage that archaeological sites are considered important by some source countries because they give a boost to the tourism sector. Option a is the correct answer choice.

Q.11) Which one of the following statements, if true, would undermine the central idea of the passage?

- a. Affluent archaeologically-rich source countries can afford to carry out their own excavations.
- b. Museums established in economically deprived archaeologically-rich source countries can display the antiques discovered there.
- c. Western countries will have to apologise to countries for looting their cultural property in the past century.
- d. UNESCO finances archaeological research in poor, but archaeologically-rich source countries.

Correct Answer: d

Explanation - The central idea of the passage is that strict cultural patrimony laws reduce incentives for foreign investment in archaeological research, thereby depriving poor, but archaeologically-rich source countries of the benefits of new archaeological research.

If UNESCO finances archaeological research in poor, but archaeologically-rich source countries, then there would be no need for these countries to drop strict cultural property laws. So, option d, if true, would undermine the central idea of the passage.

The author is specifically talking about the case of poor, but archaeologically-rich source countries. Option a, even if true, would not undermine the central idea of the passage.

Options b and c are not related to the central idea, which is about the need to drop strict cultural property laws.

Q.12) Which one of the following statements best expresses the paradox of patrimony laws?

- a. They were intended to protect cultural property, but instead resulted in the neglect of historical sites.
- b. They were aimed at protecting cultural property, but instead reduced business for auctioneers like Sotheby's.
- c. They were aimed at protecting cultural property, but instead reduced new archaeological discoveries.
- d. They were intended to protect cultural property, but instead resulted in the withholding of national treasure from museums.

Correct Answer: c

Explanation - Easy question, relating to the key point made by the author in the passage. The author's study shows that in most cases, the number of discovered sites diminishes sharply after a country passes a cultural property law.

Therein lies the paradox. Though patrimony laws were aimed at protecting cultural property, they instead reduced new archaeological discoveries.

DIRECTIONS for the question: *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.

Q.13) According to the romantics, aesthetics:

- a. is widely considered to be irrelevant to human existence.
- b. permeates all aspects of human life, philosophical and mundane.

- c. should be confined to a specific domain separate from the practical and theoretical aspects of life.
- d. is primarily the concern of philosophers and artists, rather than of ordinary people.

Correct Answer: b

Explanation - Note the lines, '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.'

So, according to the romantics, aesthetics permeates all aspects of human life, philosophical and mundane. Option b is the correct choice.

Q.14) Which one of the following statements is NOT supported by the passage?

- a. Recent studies on romanticism seek to refute the differences between national romanticisms.
- b. Romantic aesthetics are primarily expressed through fragments, aphorisms, and poems.
- c. Many romantics rejected the idea of aesthetics as a domain separate from other aspects of life.
- d. Characterising romantic aesthetics is both possible and desirable, despite the challenges involved.

Correct Answer: a

Explanation - The passage does not support the claim that recent studies on romanticism seek to refute the differences between national romanticisms. At most, the passage suggests that there are shared features across romantic traditions, but it does not state that scholars are trying to deny or refute national differences altogether.

Option b is supported by the discussion of the forms through which romantic aesthetics were often articulated, such as fragments, aphorisms, and poems.

Option c is supported by the passage's claim that romantics believed aesthetics should shape all aspects of human life rather than remain confined to a separate domain.

Option d is also supported because the passage acknowledges the difficulties involved in defining romantic aesthetics while still attempting to identify its characteristic commitments.

Q.15) The main difficulty in studying romanticism is the:

- a. absence of written accounts by romantic poets and artists.
- b. elusive and suggestive nature of romantic aesthetics.
- c. controversial and scandalous history of romantic literature.
- d. lack of clear conceptual contours of the domain.

Correct Answer: d

Explanation - Easy question. Note the line, '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.'

So, according to the passage, the main difficulty in studying romanticism is the lack of clear conceptual contours of the domain. Option d is the correct choice.

Q.16) According to the passage, recent studies on romanticism avoid "a single definition, a specific time, or a specific place" because they:

- a. prefer to highlight the paradox of romantic aesthetics as a concept.
- b. seek to discredit Lovejoy's scepticism regarding romanticism.
- c. understand that the variety of romanticisms renders a general analysis impossible.
- d. prefer to focus on the fundamental concerns of the romantics.

Correct Answer: d

Explanation - Option d is the correct choice, based on the lines, 'While warning against a reductive definition of romanticism, Isaiah Berlin, for example, still heralded the need for a general characterization: "[Although] one does have a certain sympathy with Arthur Lovejoy's despair...[he is] in this instance mistaken. There was a romantic movement...and it is important to discover what it is"...'

Thus, recent studies avoid narrow definitions of romanticism not because general analysis is impossible, but because they seek to focus on the broader and fundamental concerns shared by the romantics.

DIRECTIONS for the question: *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.*

Q.No. 17

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).

- a. Option 1
- b. Option 4
- c. Option 2
- d. Option 3

Correct Answer: d

Explanation - Option 3 is the most logical place to fit in the given sentence. The sentences prior to option 3 discuss how the constituents of an argument, i.e., premises and conclusion, are related to each other and how one part acts as support to the other. They also discuss different ways of analysing arguments.

The given sentence adds another layer to this discussion by stating that, for theoretical purposes, arguments may be considered as freestanding entities abstracted from their actual contexts of use.

Moreover, the sentence after option 3 presents the contrasting view: depending on explanatory goals, there is also much to be gained from considering arguments as they actually occur in human communicative practices.

DIRECTIONS for the question: *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.*

Q.18)

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).

- a. Option 2
- b. Option 4
- c. Option 1
- d. Option 3

Correct Answer: d

Explanation - The given sentence starts with 'Beyond undermining the monopoly of the State on the use of force'. So, the sentence before it must relate to this point.

The sentence before option 3 talks about non-State armed groups and how financial gains from crime function as a revenue stream for NSAGs, thereby strengthening their position and power.

As a result, this undermines or weakens the State's monopoly on the 'use of force', which the missing sentence mentions.

Hence, option 3 is the best place to fit the given sentence.

Also, option 2 doesn't work because the passage starts by discussing the impact or consequences of illicit arms and organized crime. Sentence after option 2 adds to this mentioning another consequence of crimes, thereby eliminating the gap of option 2.

DIRECTIONS for the question: 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.

Q.No.19

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.

Correct Answer: 2

Explanation - All sentences other than sentence 2 relate to skills - hard and soft skills - that companies are looking for in prospective hires. Sentence 2, which talks about the ideal/perfect candidate, is the odd one out.

If the sentences were to be put into a paragraph, sentence 1 would be the opening sentence. Sentence 1 says some companies are moving away from choosing prospective hires based on technical abilities alone.

Sentence 3 follows 1, stating that some job descriptions are frequently asking for candidates to demonstrate soft skills.

Sentence 5 adds to 3, and sentence 4 concludes the paragraph by clarifying that practical expertise is still important in many jobs.

DIRECTIONS for the question: *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.*

Q.No. 20

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 southeast 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.

Correct Answer: 2

Explanation - All sentences except 2 relate either to the language Bo or to its last speaker, Boa Senior. Sentence 2, which is about the collapse of the indigenous population on the island, is the odd one out.

If the sentences were to be arranged into a paragraph, sentence 4 is the best starting sentence. Sentence 4 mentions 'an ancient tribal language'. Sentence 3 names this language and therefore follows 4.

These sentences are followed by 1 and 5, both of which relate to Boa Senior, the last speaker of the language.

DIRECTIONS for the question: *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.*

Q.21)

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.

Correct Answer: 3142

Explanation - Sentence 3 is a general statement that outlines the main idea of the paragraph. So, 3 is the starting sentence.

All the other sentences relate to Veena Sahajwalla's approach to solving the problem of e-waste. Therefore, sentence 1, which introduces Veena Sahajwalla, follows sentence 3.

Sentence 4 outlines her plan, and sentence 2 adds to 4 by explaining how she plans to separate, extract, and reuse the tangled materials in e-waste.

Therefore, 3142 is the correct order.

DIRECTIONS for the question: 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.

Q.22)

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 and learning no longer required the presence of a mentor; it could be done privately.

Correct Answer: 2431

Explanation - The paragraph explains how the process of learning has transformed over time. Sentence 2 is the best sentence to start the paragraph, as it introduces how the printing press transformed the learning process from listening and memorisation to reading.

Sentence 4 adds to 2 and therefore follows it.

Sentence 3 follows 4 as it expands on this transformation and introduces the new idea of universal literacy taking root during the industrial era.

Sentence 1 concludes the paragraph by referring to the present situation, centuries later, where reading still remains central to formal learning.

Therefore, 2431 is the correct order.

DIRECTIONS for the question: *The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.*

Q.23)

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.

- a. There is an increasing number of predatory birds and plants on the island despite the presence of pests which is a positive development.
- b. 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.
- c. There is a huge positive transformation of the ecosystem of the island when brought under environmental protection.
- d. Flowering plants, herbs and birds are now being protected on this wonderful Antarctic island.

Correct Answer: b

Explanation - The paragraph describes how, in the absence of pests, birds have returned to breed, plants have started growing back stronger, and the ecosystem in general has transformed for the better on the island. Option b is the best of the given summaries.

Option a is incorrect because the paragraph states that pests 'were' on the island, but are no longer there.

The paragraph does not say that the island has been 'brought under environmental protection'. Therefore, option c is incorrect.

The paragraph also does not specifically state that the island is an Antarctic island. Hence, option d is incorrect.

DIRECTIONS *for the question:* The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Q.24)

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 attentioneconomy.

- a. 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.
- b. 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.
- c. The desire to attract attention is so deep-rooted in individual consciousness that people are willing to go to any lengths to achieve it.
- d. The image of perfectionism is reflected in and perpetuated by the media; and people do their best to adhere to these ideals.

Correct Answer: a

Explanation - The paragraph states that society's expectations, though not a new phenomenon, have become multifarious and contradictory. The perfectionism of the 1950s involved seamless conformity to values, behaviour, and appearance, whereas perfectionism today is about standing out.

Option a is the best summary because it captures all the key ideas of the passage. Option b is incorrect because the paragraph does not say that pressure to appear perfect causes 'tension and conflict'.

Option c, which focuses on the deep-rooted desire to attract attention, is not the main focus of the passage.

Option d talks about the role of media, which the paragraph does not discuss.

Section : DI & Reasoning

DIRECTIONS for the question: Read the information given below and answer the question that follows.

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.

Q.25) What was Rini's score in the project?

Correct answer - 60

Explanation -

Scores	Test Weight = 60%	Project Weight = 40%	Overall
Mathew	40	80	56
Biman	50	40	46
Rini	60	60	60
Amala	60	80	68
Shyam	70	60	66
Koli	80	40	64

Project	Weight = 40%
80	AmalaMathew
60	Rini Shyamal
40	Koli Biman

Q.26) What was the weight of the test component?

- A. 0.75
- B. 0.50
- C. 0.60
- D. 0.40

Explanation -

Scores	Test Weight = 60%	Project Weight = 40%	Overall
Mathew	40	80	56
Biman	50	40	46
Rini	60	60	60
Amala	60	80	68
Shyam	70	60	66
Koli	80	40	64

Project	Weight = 40%
80	AmalaMathew
60	Rini Shyamal
40	Koli Biman

Q.27) What was the maximum aggregate score obtained by the students?

- A. 66
- B. 68
- C. 80
- D. 62

Correct answer - 68

Explanation -

Scores	Test Weight = 60%	Project Weight = 40%	Overall
Mathew	40	80	56
Biman	50	40	46
Rini	60	60	60
Amala	60	80	68
Shyam	70	60	66
Koli	80	40	64

Project	Weight = 40%
80	AmalaMathew
60	Rini Shyamal
40	Koli Biman

Q.28) What was Mathew's score in the test?

Correct answer - 40

Explanation -

Scores	Test Weight = 60%	Project Weight = 40%	Overall
Mathew	40	80	56
Biman	50	40	46
Rini	60	60	60
Amala	60	80	68
Shyam	70	60	66
Koli	80	40	64

Project	Weight = 40%
80	AmalaMathew
60	Rini Shyamal
40	Koli Biman

Q.29) Which of the following pairs of students were part of the same project team?

- i) Amala and Biman
- ii) Koli and Mathew
- A. Neither i) nor ii)
- B. Both i) and ii)
- C. Only i)
- D. Only ii)

Explanation -

Scores	Test Weight = 60%	Project Weight = 40%	Overall
Mathew	40	80	56
Biman	50	40	46
Rini	60	60	60
Amala	60	80	68
Shyam	70	60	66
Koli	80	40	64

Project	Weight = 40%
80	AmalaMathew
60	Rini Shyamal
40	Koli Biman

DIRECTIONS for the question: Read the information given below and answer the question that follows.

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

Q.30) What was the total number of registrations in April?

Correct answer - 120

Explanation -

	Jan	Feb	Mar	Apr	May
Online	40	80	50	80	100
Offline	80	50	60	40	30
Total	120	130	110	120	130

Q.31) What was the number of online registrations in January?

Correct answer - 40

Explanation -

	Jan	Feb	Mar	Apr	May
Online	40	80	50	80	100
Offline	80	50	60	40	30
Total	120	130	110	120	130

Q.32) 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.
- A. Only II
- B. Only I
- C. Both I and II
- D. Neither I nor II

Correct answer - Option B

Explanation -

	Jan	Feb	Mar	Apr	May
Online	40	80	50	80	100
Offline	80	50	60	40	30
Total	120	130	110	120	130

Q.33) What best can be concluded about the number of offline registrations in February?

- A. 30 or 50 or 80
- B. 80
- C. 50 or 80
- D. 50

Correct answer - 50

Explanation -

	Jan	Feb	Mar	Apr	May
Online	40	80	50	80	100
Offline	80	50	60	40	30
Total	120	130	110	120	130

Q.34) Which pair of months definitely had the same total number of registrations?

- I. January and April
- II. February and May

- A. Only I
- B. Neither I nor II
- C. Only II
- D. Both I and II

Correct answer - Option D

Explanation -

	Jan	Feb	Mar	Apr	May
Online	40	80	50	80	100
Offline	80	50	60	40	30
Total	120	130	110	120	130

DIRECTIONS for the question: Read the information given below and answer the question that follows.

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.

Q.35) How many Split Inverter ACs did D2 sell?

Correct answer - 14

Explanation -

	Inverter	Noninverter	
Win	9	6	15
Split	36	9	45
	45	15	60

Split Acs			
	Total	Inv	Non-Inv
D1	10	8	2
D2	$14 + x$	14	x
D3	10	7	3
D4	$11 - x$	7	$4 - x$

Window ACs			
	Total	Inv	Non-Inv
D1	5	5	0
D2	6	2	4
D3	2	0	2
D4	2	2	0

Q.36) What percentage of ACs sold were of Non-inverter type?

- A. 33.33%
- B. 20.00%
- C. 25.00%
- D. 75.00%

Correct answer - Option C

Explanation -

	Inverter	Noninverter	
Win	9	6	15
Split	36	9	45
	45	15	60

Split Acs			
	Total	Inv	Non-Inv
D1	10	8	2
D2	$14 + x$	14	x
D3	10	7	3
D4	$11 - x$	7	$4 - x$

Window ACs			
	Total	Inv	Non-Inv
D1	5	5	0
D2	6	2	4
D3	2	0	2
D4	2	2	0

Q.37) What was the total number of ACs sold by D2 and D4?

Correct answer - 33

Explanation -

	Inverter	Noninverter	
Win	9	6	15
Split	36	9	45
	45	15	60

Split Acs			
	Total	Inv	Non-Inv

D1	10	8	2
D2	$14 + x$	14	x
D3	10	7	3
D4	$11 - x$	7	$4 - x$

Window ACs			
	Total	Inv	Non-Inv
D1	5	5	0
D2	6	2	4
D3	2	0	2
D4	2	2	0

Q.38) Which of the following statements is necessarily false?

- A. D2 sold the highest number of ACs.
- B. D1 and D3 together sold more ACs as compared to D2 and D4 together.
- C. D1 and D3 sold an equal number of Split ACs.
- D. D4 sold more Split ACs as compared to D3.

Correct answer - Option B

Explanation -

	Inverter	Noninverter	
Win	9	6	15
Split	36	9	45
	45	15	60

Split Acs			
	Total	Inv	Non-Inv

D1	10	8	2
D2	$14 + x$	14	x
D3	10	7	3
D4	$11 - x$	7	$4 - x$

Window ACs			
	Total	Inv	Non-Inv
D1	5	5	0
D2	6	2	4
D3	2	0	2
D4	2	2	0

Q.39) If D3 and D4 sold an equal number of ACs, then what was the number of Noninverter ACs sold by D2?

- A. 7
- B. 5
- C. 6
- D. 4

Correct answer - 5

Explanation -

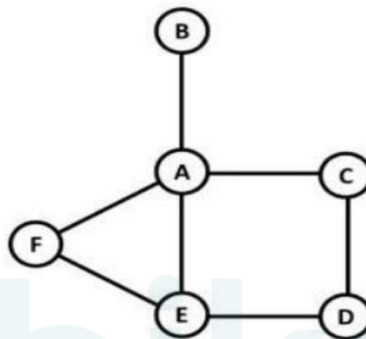
	Inverter	Noninverter	
Win	9	6	15
Split	36	9	45
	45	15	60

Split Acs			
	Total	Inv	Non-Inv
D1	10	8	2
D2	$14 + x$	14	x
D3	10	7	3
D4	$11 - x$	7	$4 - x$

Window ACs			
	Total	Inv	Non-Inv
D1	5	5	0
D2	6	2	4
D3	2	0	2
D4	2	2	0

DIRECTIONS for the question: Read the information given below and answer the question that follows.

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.

Q.40) Which one among the following stations is visited the largest number of times?

- A. Station D

- B. Station C
- C. Station F
- D. Station E

Correct answer - option D

Explanation -

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E	F	A/E	F	A
Team 3	A	C	D	E	D	C	A
Team 4	A	E	A	C	A	E	A

Q.41) How many times do the teams pass through Station B in a day?

- A. Station D
- B. Station C
- C. Station F
- D. Station E

Correct answer – 2

Explanation

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E	F	A/E	F	A
Team 3	A	C	D	E	D	C	A
Team 4	A	E	A	C	A	E	A

Q.42) Which team patrols the street connecting Stations D and E at 10:15 hrs?

- A. Team 2
- B. Team 1
- C. Team 4
- D. Team 3

Correct answer - Option D

Explanation -

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E	F	A/E	F	A
Team 3	A	C	D	E	D	C	A
Team 4	A	E	A	C	A	E	A

Q.43) How many times does Team 4 pass through Station E in a day?

Correct answer - 2

Explanation -

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E	F	A/E	F	A
Team 3	A	C	D	E	D	C	A
Team 4	A	E	A	C	A	E	A

Q.44) How many teams pass through Station C in a day?

- A. 2
- B. 1
- C. 3
- D. 4

Correct answer – 2

Explanation -

	9:00	9:30	10:00	10:30	11:00	11:30	12:00
Team 1	A	B	A	E	A	B	A
Team 2	A	F	E	F	A/E	F	A
Team 3	A	C	D	E	D	C	A
Team 4	A	E	A	C	A	E	A

Section : Quantitative Ability

Q.45) For a real number x , if $1/2, \log_3(2^x - 9)/\log_3 4$, and $\log_5(2^x + 17/2)/\log_5 4$ are in an arithmetic progression, then the common difference is

- A. $\log_4 7$
- B. $\log_4(3/2)$
- C. $\log_4(7/2)$
- D. $\log_4(23/2)$

Correct Answer - C. $\log_4(7/2)$

Explanation -

Using the property,

$$\log_a b / \log_a c = \log_c b$$

the terms become:

$$1/2, \log_4(2^x - 9), \log_4(2^x + 17/2)$$

Since they are in A.P.,

$$2\log_4(2^x - 9) = 1/2 + \log_4(2^x + 17/2)$$

Now,

$$1/2 = \log_4 2$$

So,

$$\begin{aligned} 2\log_4(2^x - 9) &= \log_4 2 + \log_4(2^x + 17/2) \\ &= \log_4[2(2^x + 17/2)] \end{aligned}$$

Therefore,

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

Hence,

$$(2^x - 9)^2 = 2^{x+1} + 17$$

Let,

$$y = 2^x$$

Then,

$$\begin{aligned}(y - 9)^2 &= 2y + 17 \\ y^2 - 18y + 81 &= 2y + 17 \\ y^2 - 20y + 64 &= 0 \\ (y - 16)(y - 4) &= 0\end{aligned}$$

So,

$$y = 16 \text{ or } y = 4$$

Therefore,

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

or

$$\begin{aligned}2^x &= 4 \Rightarrow x = 2 \\ \text{If } x &= 2 \\ 2^x - 9 &= 4 - 9 = -5\end{aligned}$$

which is invalid since the argument of a logarithm cannot be negative.
Hence,

$$x = 4$$

Now the common difference is:

$$\begin{aligned}\log_4(16 - 9) - 1/2 \\ &= \log_4 7 - \log_4 2 \\ &= \log_4(7/2)\end{aligned}$$

Hence, the common difference is $\log_4(7/2)$.

Q.46) 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

- A. 14
- B. 42
- C. 16
- D. 44

Correct Answer - C. 16

Explanation -

We need exactly 41 integers that can be expressed as powers of 2 between 8^m and 8^n .
Now,

$$8^m = 2^{3m}$$

and

$$8^n = 2^{3n}$$

So, we need 41 powers of 2 strictly between 2^{3m} and 2^{3n} .
These numbers are:

$$2^{3m+1}, 2^{3m+2}, 2^{3m+3}, \dots, 2^{3n-1}$$

The number of such powers is:

$$\begin{aligned} & (3n - 1) - (3m + 1) + 1 \\ & = 3n - 3m - 1 \end{aligned}$$

Since this count is 41 ,

$$\begin{aligned} 3n - 3m - 1 &= 41 \\ 3(n - m) &= 42 \\ n - m &= 14 \end{aligned}$$

To get the smallest possible value of $n + m$, take the smallest positive integer value of m :

$$m = 1$$

Then,

$$n = 15$$

Therefore,

$$n + m = 15 + 1 = 16$$

Q.47) For some real numbers a and b , the system of equations

$$\begin{aligned} x + y &= 4 \\ (a + 5)x + (b^2 - 15)y &= 8b \end{aligned}$$

has infinitely many solutions for x and y . Then, the maximum possible value of ab is

Explanation -

For two linear equations to have infinitely many solutions, their coefficients must be proportional.

So,

$$(a + 5)/1 = (b^2 - 15)/1 = 8b/4$$

Therefore,

$$a + 5 = b^2 - 15 = 2b$$

Using,

$$\begin{aligned}b^2 - 15 &= 2b \\b^2 - 2b - 15 &= 0 \\b^2 - 5b + 3b - 15 &= 0 \\b(b - 5) + 3(b - 5) &= 0 \\(b - 5)(b + 3) &= 0\end{aligned}$$

So,

$$b = 5 \text{ or } b = -3$$

Now,

$$a + 5 = 2b$$

Case 1:

$$\begin{aligned}\text{If } b &= 5, \\a + 5 &= 10 \\a &= 5 \\ab &= 25\end{aligned}$$

Case 2:

$$\begin{aligned}\text{If } b &= -3, \\a + 5 &= -6 \\a &= -11 \\ab &= (-11)(-3) = 33\end{aligned}$$

Hence, the maximum possible value of ab is 33 .

Q.48) If x is a positive real number such that

$$x^8 + (1/x)^8 = 47,$$

then the value of

$$x^9 + (1/x)^9$$

is

- A. $40\sqrt{5}$
- B. $36\sqrt{5}$
- C. $30\sqrt{5}$
- D. $34\sqrt{5}$

Correct Answer - D. $34\sqrt{5}$

Explanation -

Given,

$$x^8 + 1/x^8 = 47$$

Now,

$$\begin{aligned}(x^4 + 1/x^4)^2 &= x^8 + 1/x^8 + 2 \\ &= 47 + 2 \\ &= 49\end{aligned}$$

Therefore,

$$x^4 + 1/x^4 = 7$$

Again,

$$\begin{aligned}(x^2 + 1/x^2)^2 &= x^4 + 1/x^4 + 2 \\ &= 7 + 2 \\ &= 9\end{aligned}$$

So,

$$x^2 + 1/x^2 = 3$$

Now,

$$\begin{aligned}(x + 1/x)^2 &= x^2 + 1/x^2 + 2 \\ &= 3 + 2 \\ &= 5\end{aligned}$$

Hence,

$$x + 1/x = \sqrt{5}$$

Using,

$$\begin{aligned}(x + 1/x)^3 &= x^3 + 1/x^3 + 3(x + 1/x) \\ (\sqrt{5})^3 &= x^3 + 1/x^3 + 3\sqrt{5} \\ 5\sqrt{5} &= x^3 + 1/x^3 + 3\sqrt{5}\end{aligned}$$

Therefore,

Again,

$$\begin{aligned}(x^3 + 1/x^3)^3 &= x^9 + 1/x^9 + 3(x^3 + 1/x^3) \\ (2\sqrt{5})^3 &= x^9 + 1/x^9 + 3(2\sqrt{5}) \\ 40\sqrt{5} &= x^9 + 1/x^9 + 6\sqrt{5}\end{aligned}$$

Hence,

$$x^9 + 1/x^9 = 34\sqrt{5}$$

Q.49) 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

Correct Answer - 9

Explanation -

Let the roots be α and β .

Given,

$$1/\alpha - 1/\beta = 1/3$$

Squaring both sides,

$$\begin{aligned}(1/\alpha - 1/\beta)^2 &= 1/9 \\ 1/\alpha^2 + 1/\beta^2 - 2/\alpha\beta &= 1/9\end{aligned}$$

Now,

$$1/\alpha^2 + 1/\beta^2 = 5/9$$

So,

$$\begin{aligned}5/9 - 2/\alpha\beta &= 1/9 \\ 4/9 &= 2/\alpha\beta\end{aligned}$$

Therefore,

$$\alpha\beta = 9/2$$

Also,

$$\begin{aligned}1/\alpha^2 + 1/\beta^2 &= (\alpha^2 + \beta^2)/(\alpha\beta)^2 \\ 5/9 &= [(\alpha + \beta)^2 - 2\alpha\beta]/(\alpha\beta)^2\end{aligned}$$

Substituting $\alpha\beta = 9/2$,

$$5/9 = [(\alpha + \beta)^2 - 9]/(81/4)$$

Multiplying throughout,

$$45/4 = (\alpha + \beta)^2 - 9$$

$$(\alpha + \beta)^2 = 81/4$$

Hence,

$$\alpha + \beta = \pm 9/2$$

Now, for the equation $x^2 + bx + c = 0$,

$$\alpha + \beta = -b$$

and

$$\alpha\beta = c$$

So,

$$b = -(\alpha + \beta)$$

and

$$c = 9/2$$

Therefore,

$$b + c = -(\alpha + \beta) + 9/2$$

To maximize $(b + c)$, take

$$\alpha + \beta = -9/2$$

Thus,

$$b + c = -(-9/2) + 9/2$$

$$= 9$$

Hence, the largest possible value of $(b + c)$ is 9.

Q.50) The sum of the first two natural numbers, each having 15 factors (including 1 and the number itself), is

Correct Answer - 468

Explanation -

If an integer N can be prime factorized as

$$N = p^a q^b$$

then the number of factors of N is

For a number to have 15 factors,

$$15 = 15 \times 1 = 5 \times 3$$

So, the possible forms are:

$$N = p^{14}$$

or

$$N = p^4 q^2$$

where p and q are distinct primes.

Now,

The smallest number of the form

$$N = p^{14}$$

is

$$2^{14} = 16384$$

The smallest number of the form

$$N = p^4 q^2$$

is

$$2^4 \times 3^2 = 16 \times 9 = 144$$

The next smallest number of the same form is

$$2^2 \times 3^4 = 4 \times 81 = 324$$

Thus, the first two natural numbers having exactly 15 factors are:

144 and 324

Therefore,

$$144 + 324 = 468$$

Hence, the required sum is 468.

Q.51) 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

Correct Answer - 5

Explanation -

Given,

$$\begin{aligned}5^{n-1} &< 3^{n+1} \\ \Rightarrow 5^{n-1} &< 9 \times 3^{n-1} \\ \Rightarrow (5/3)^{n-1} &< 9 \\ \Rightarrow (3/5)^{n-1} &> 1/9\end{aligned}$$

Now,

$$\begin{aligned}(0.6)^4 &= 0.1296 \\ (0.6)^5 &= 0.07776\end{aligned}$$

Since,

$$1/9 \approx 0.111$$

we get,

$$\begin{aligned}n - 1 &\leq 4 \\ \Rightarrow n &\leq 5\end{aligned}$$

So,

$$1 \leq n \leq 5$$

Now consider,

$$\begin{aligned}3^{n+1} &< 2^{n+m} \\ \Rightarrow 3 \times 3^n &< 2^n \times 2^m \\ \Rightarrow 3 \times (3/2)^n &< 2^m\end{aligned}$$

Since the left side increases as n increases, we check the maximum value of n, i.e. n = 5.

So,

$$\begin{aligned}3 \times (3/2)^5 &< 2^m \\ 3 \times 243/32 &< 2^m \\ 729/32 &< 2^m \\ 22.78125 &< 2^m\end{aligned}$$

Now,

$$\begin{aligned}2^4 &= 16 \\ 2^5 &= 32\end{aligned}$$

Hence,

$$m = 5$$

Therefore, the least integer value of m is 5.

Q.52) 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

- A. 17
- B. 21
- C. 16
- D. 20

Correct Answer - 21

Explanation -

Let Rahul, Rakshita and Gurmeet take A, B and C days respectively to finish the work alone.

Then, their one-day work rates are:

$1/A$, $1/B$ and $1/C$

Given,

Rahul, Rakshita and Gurmeet together would take more than 7 days.

Therefore,

$$1/A + 1/B + 1/C < 1/7$$

Now, they worked together for 6 days and then Rakshita alone worked for 3 more days to complete the work.

So,

$$\begin{aligned} 6(1/A + 1/B + 1/C) + 3/B &= 1 \\ \Rightarrow 3/B &= 1 - 6(1/A + 1/B + 1/C) \end{aligned}$$

Since,

$$1/A + 1/B + 1/C < 1/7$$

we get,

$$3/B > 1 - 6/7$$

$$\Rightarrow 3/B > 1/7$$

$$\Rightarrow 1/B > 1/21$$

$$\Rightarrow B < 21$$

So, Rakshita must take less than 21 days to finish the work alone.

Now, also given that Rahul and Gurmeet together would take less than 15 days.

Therefore,

$$1/A + 1/C > 1/15$$

Using,

$$1/A + 1/B + 1/C < 1/7$$

we get,

$$\begin{aligned} 1/B &< 1/7 - 1/15 \\ &= 8/105 \\ \Rightarrow B &> 105/8 \\ \Rightarrow B &> 13.125 \end{aligned}$$

Hence,

$$13.125 < B < 21$$

Among the given options, only 21 is not possible.

Hence, the answer is 21.

Q.53) 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

- A. 21
- B. 24
- C. 16
- D. 17

Correct Answer - 17

Explanation -

Mixtures A and B are mixed in the ratio 2:3 to form mixture C.

Assume 20 kg of mixture A is mixed with 30 kg of mixture B.

So, total mixture C = 50 kg

Mixture A has cocoa and sugar in the ratio 3 : 2.

Therefore, sugar in mixture A = $2/5 \times 20 = 8$ kg

Mixture B has coffee and sugar in the ratio 7 : 3.

Therefore, sugar in mixture B = $3/10 \times 30 = 9$ kg

Hence, total sugar in mixture C = $8 + 9 = 17$ kg

Now, 50 kg of mixture C is mixed with an equal amount of milk.

So, total final mixture = $50 + 50 = 100$ kg

Therefore, percentage of sugar in the drink

$$\begin{aligned} &= (17/100) \times 100 \\ &= 17\% \end{aligned}$$

Hence, the correct answer is 17.

Q.54) 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

- A. 74000
- B. 75000
- C. 72000
- D. 73000

Correct Answer - 73000

Explanation -

Population in 2021:

$$100000(1 - y/100)$$

Population in 2022:

$$100000(1 - y/100)(1 + x/100)$$

Given that population in 2022 is greater than population in 2020,

$$\begin{aligned} 100000(1 - y/100)(1 + x/100) &> 100000 \\ \Rightarrow (1 - y/100)(1 + x/100) &> 1 \end{aligned}$$

$$\Rightarrow (100 - y)(100 + x) > 10000$$

$$\text{Now, } x - y = 10$$

$$\Rightarrow x = y + 10$$

Substituting,

$$(100 - y)(110 + y) > 10000$$

$$11000 + 100y - 110y - y^2 > 10000$$

$$1000 - 10y - y^2 > 0$$

$$y^2 + 10y - 1000 < 0$$

Completing the square,

$$y^2 + 10y + 25 < 1025$$

$$(y + 5)^2 < 1025$$

Now,

$$\sqrt{1025} \approx 32$$

So,

$$y + 5 < 32.015$$

Maximum possible integer value of $y = 27$

To get the minimum population in 2021, y must be maximum.

Therefore,

Population in 2021

$$= 100000(1 - 27/100)$$

= 73000

Hence, the lowest possible population in 2021 was 73000.

Q.55) 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

- A. 4.2%
- B. 15.5%
- C. 16%
- D. 9.7%

Correct Answer - 15.5%

Explanation -

Assume the merchant pays for 95×100 m of cloth.

Since he gets 5% extra cloth free, he receives:

95×105 m of cloth

Cost price paid by him:

$95 \times 100 \times 100 = \text{Rs. } 9,50,000$

Now, he sells the cloth at Rs. 110 per meter with a 5% discount.

So, effective selling price per meter:

$110 \times 95/100 = \text{Rs. } 104.5$

But while selling, he gives only 95 cm instead of 100 cm.

Thus, total money collected:

$104.5 \times (95 \times 105/0.95)$

$= 104.5 \times 100 \times 105$

Now,

Profit ratio

$= (104.5 \times 100 \times 105)/(95 \times 100 \times 100)$

$= 1.155$

Hence,

Profit % = $(1.155-1) \times 100$

$= 15.5\%$

Therefore, the resulting profit earned by him is 15.5%.

Q.56) 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

- A. 1.5
- B. 2

C. 0.5

Correct Answer - 1

Explanation -

Let the average weight of A, B and C be y .

So,

$$\begin{aligned}(A + B + C)/3 &= y \\ \Rightarrow A + B + C &= 3y\end{aligned}$$

When D joins,

$$\begin{aligned}(A + B + C + D)/4 &= y - x \\ \Rightarrow 3y + D &= 4y - 4x \\ \Rightarrow D &= y - 4x\end{aligned}$$

When E joins,

$$\begin{aligned}(A + B + C + E)/4 &= y + 2x \\ \Rightarrow 3y + E &= 4y + 8x \\ \Rightarrow E &= y + 8x\end{aligned}$$

Given,

$$\begin{aligned}E - D &= 12 \\ \Rightarrow (y + 8x) - (y - 4x) &= 12 \\ \Rightarrow 12x &= 12 \\ \Rightarrow x &= 1\end{aligned}$$

Hence, the value of x is 1.

Q.57) 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

- A. $3(3 - \sqrt{5})$
- B. $12(\sqrt{5} - 2)$
- C. $3(3 + \sqrt{5})$
- D. $3(\sqrt{5} - 1)$

Correct Answer - $3(3 - \sqrt{5})$

Explanation -

Let:

B_1 = speed of the faster boat in still water

B_2 = speed of the slower boat in still water

S = speed of the river

D = distance between ports A and B

The first boat takes:

2 hours downstream

3 hours upstream

So, total round-trip time = 5 hours.

The second boat takes 6 hours for the round trip, so it is the slower boat.

Now,

Downstream speed of first boat = $B_1 + S$

Upstream speed of first boat = $B_1 - S$

Since time ratio is 2:3, speed ratio will be 3:2.

So,

$$\begin{aligned}(B_1 + S)/(B_1 - S) &= 3/2 \\ \Rightarrow 2(B_1 + S) &= 3(B_1 - S) \\ \Rightarrow 2B_1 + 2S &= 3B_1 - 3S \\ \Rightarrow B_1 &= 5S\end{aligned}$$

Now,

$$\begin{aligned}D &= \text{downstream speed} \times \text{time} \\ &= (B_1 + S) \times 2 \\ &= (5S + S) \times 2 \\ &= 12S\end{aligned}$$

For the slower boat,

$$D/(B_2 + S) + D/(B_2 - S) = 6$$

Substituting $D = 12S$,

$$12S/(B_2 + S) + 12S/(B_2 - S) = 6$$

Dividing by 6,

$$2S/(B_2 + S) + 2S/(B_2 - S) = 1$$

Taking LCM,

$$\begin{aligned}[2S(B_2 - S) + 2S(B_2 + S)]/(B_2^2 - S^2) &= 1 \\ 4S_2/(B_2^2 - S^2) &= 1 \\ \Rightarrow B_2^2 - 4SB_2 - S^2 &= 0\end{aligned}$$

Divide throughout by S^2 :

$$(B_2/S)^2 - 4(B_2/S) - 1 = 0$$

Let,

$$x = B_2/S$$

Then,

$$\begin{aligned}x^2 - 4x - 1 &= 0 \\ \Rightarrow x &= [4 \pm \sqrt{(16 + 4)}]/2 \\ &= [4 \pm \sqrt{20}]/2 \\ &= 2 \pm \sqrt{5}\end{aligned}$$

Since speed is positive,

$$x = 2 + \sqrt{5}$$

Therefore,

$$B_2 = S(2 + \sqrt{5})$$

Now, time taken by slower boat from A to B (downstream):

$$\begin{aligned}&= D/(B_2 + S) \\ &= 12S/[(2 + \sqrt{5})S + S] \\ &= 12/(3 + \sqrt{5})\end{aligned}$$

Rationalising,

$$\begin{aligned}&= 12(3 - \sqrt{5})/(9 - 5) \\ &= 3(3 - \sqrt{5})\end{aligned}$$

Hence, the required time is $3(3 - \sqrt{5})$ hours.

Q.58) 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

Correct Answer - 340

Explanation -

Let the number of mangoes at the beginning be $4x$.

Since mangoes form 40% of the total stock, the total number of fruits is $10x$.

Therefore, bananas and apples together = $6x$.

Let the number of bananas be y .

Then, the number of apples = $6x - y$.

Now, fruits sold during the day:

50% of mangoes = $2x$

Bananas sold = 96

40% of apples = $0.4(6x - y)$

Given that total fruits sold = 50% of total stock,

$$\begin{aligned}
2x + 96 + 0.4(6x - y) &= 5x \\
\Rightarrow 2x + 96 + 2.4x - 0.4y &= 5x \\
\Rightarrow 4.4x + 96 - 0.4y &= 5x \\
\Rightarrow 96 - 0.4y &= 0.6x
\end{aligned}$$

Multiplying by 10,

$$\begin{aligned}
960 - 4y &= 6x \\
\Rightarrow 480 - 2y &= 3x \\
\Rightarrow x &= 160 - (2y/3)
\end{aligned}$$

For x to be an integer, y must be a multiple of 3 .

Also, since 96 bananas are sold,

$$y \geq 96$$

Now, apples must be at least 1 .

So,

$$6x - y > 0$$

Substituting x ,

$$\begin{aligned}
6(160 - 2y/3) - y &> 0 \\
960 - 4y - y &> 0
\end{aligned}$$

$$960 - 5y > 0$$

$$\Rightarrow y < 192$$

Since y must be a multiple of 3 , the maximum possible value of y is 189 .

To minimize total fruits = $10x$, we minimize x .

Now,

$$\begin{aligned}
x &= 160 - (2/3)(189) \\
&= 160 - 126 \\
&= 34
\end{aligned}$$

Therefore,

$$\begin{aligned}
\text{Total fruits} &= 10x \\
&= 10 \times 34 \\
&= 340
\end{aligned}$$

Hence, the smallest possible total number of fruits is 340.

Q.59) 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

Correct Answer - 42

Explanation -

Let the number of coins collected by A and B in one week be $3x$ and $4x$ respectively.
Total coins collected by A in 5 weeks:

$$5 \times 3x = 15x$$

Since $15x$ is a multiple of 7, and 15 is not divisible by 7,
 x must be a multiple of 7.

Now, total coins collected by B in 3 weeks:

$$3 \times 4x = 12x$$

Since $12x$ is a multiple of 24,
 x must be a multiple of 2.

Therefore, x must be a common multiple of 7 and 2.

Minimum possible value of $x = 14$

Hence, minimum coins collected by A in one week:

$$3x = 3 \times 14 = 42$$

Therefore, the minimum possible number of coins collected by A in one week is 42.

Q.60) 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

Correct Answer - 36 days

Explanation -

Let Gautam's and Suhani's one-day work capacities be G and S respectively.

Given,

If Gautam works at 60% efficiency, and Suhani works at 150% efficiency, the total work remains unchanged.

So,

$$\begin{aligned} 0.6G + 1.5S &= G + S \\ \Rightarrow G - 0.6G &= 1.5S - S \\ \Rightarrow 0.4G &= 0.5S \\ \Rightarrow 4G &= 5S \\ \Rightarrow G/S &= 5/4 \end{aligned}$$

Hence, Gautam is 1.25 times as efficient as Suhani.

Let Suhani alone complete the work in x days.

Then Gautam alone will complete the work in:

$$x/1.25 = 4x/5 \text{ days}$$

Together, their combined work rate is:

$$\begin{aligned} \frac{1}{x} + \frac{5}{4x} \\ = \frac{9}{4x} \end{aligned}$$

Since together they finish the work in 20 days,

$$\begin{aligned} \frac{4x}{9} &= 20 \\ \Rightarrow x &= 45 \end{aligned}$$

Therefore, Gautam alone takes:

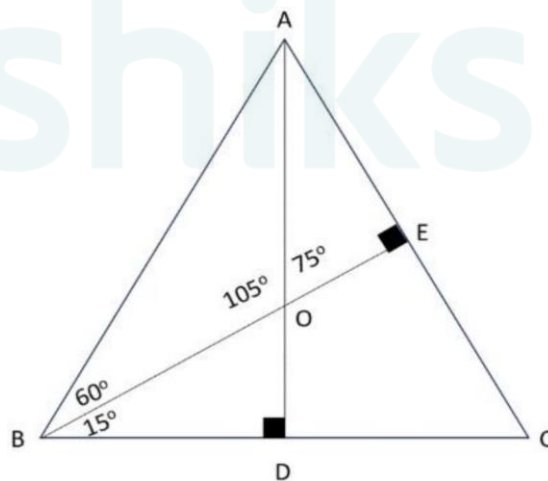
Hence, the faster worker takes 36 days to complete the work alone.

Q.61) Let $\triangle ABC$ 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 $\angle AOB = 105^\circ$, then AD/BE equals

- A. $2\sin 15^\circ$
- B. $\cos 15^\circ$
- C. $2\cos 15^\circ$
- D. $\sin 15^\circ$

Correct Answer - $2\cos 15^\circ$

Explanation -



Using area of triangle ABC ,

$$\left(\frac{1}{2}\right) \times AD \times BC = \left(\frac{1}{2}\right) \times BE \times AC$$

Therefore,

$$AD/BE = AC/BC$$

Now,

$$\begin{aligned}\angle AOB + \angle AOE &= 180^\circ \\ \Rightarrow \angle AOE &= 75^\circ\end{aligned}$$

In triangle AOE,

$$\angle AOE + \angle OAE + \angle AEO = 180^\circ$$

Since $AO \perp BC$ and $BE \perp AC$,
we get,

$$\angle OAE = 15^\circ$$

By symmetry in the isosceles triangle,

$$\angle ABD = \angle BCA = 75^\circ$$

Also,

$$\angle ABC = 75^\circ - 15^\circ = 60^\circ$$

Now, in right triangle ABE,

$$BE = AB \times \cos 60^\circ$$

In right triangle BEC,

$$BE = BC \times \cos 15^\circ$$

Equating,

$$AB \times \cos 60^\circ = BC \times \cos 15^\circ$$

Since $AB = AC$,

$$AC/BC = \cos 15^\circ / \cos 60^\circ$$

$$= \cos 15^\circ / (1/2)$$

$$= 2\cos 15^\circ$$

Hence,

$$AD/BE = 2\cos 15^\circ.$$

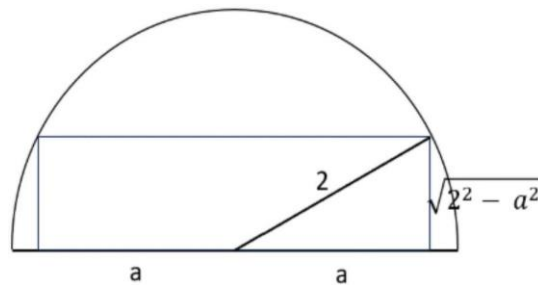
Q.62) A rectangle with the largest possible area is drawn inside a semicircle of radius 2 cm. Then, the ratio of the lengths of the largest to the smallest side of this rectangle is

- A. 2 : 1
- B. $\sqrt{5}$: 1
- C. 1 : 1

D. $\sqrt{2}:1$

Correct Answer - 2 : 1

Explanation -



Let the longer side of the rectangle (lying on the diameter) be $2a$.
Since the rectangle is inside a semicircle of radius 2 cm, the height of the rectangle is:

$$\begin{aligned} & \sqrt{(2^2 - a^2)} \\ &= \sqrt{(4 - a^2)} \end{aligned}$$

So, area of the rectangle:

$$A = 2a \times \sqrt{(4 - a^2)}$$

To maximize A , maximize A^2 .

$$\begin{aligned} A^2 &= 4a^2(4 - a^2) \\ &= 16a^2 - 4a^4 \\ &= 16 - 4(a^2 - 2)^2 \end{aligned}$$

The maximum value occurs when

$$\begin{aligned} a^2 &= 2 \\ \Rightarrow a &= \sqrt{2} \end{aligned}$$

Then,

$$\begin{aligned} \text{shorter side} &= \sqrt{(4 - 2)} \\ &= \sqrt{2} \end{aligned}$$

Longer side = $2a$

$$= 2\sqrt{2}$$

Therefore, ratio of longer side to shorter side:

$$\begin{aligned} & 2\sqrt{2} : \sqrt{2} \\ & = 2 : 1 \end{aligned}$$

Hence, the required ratio is 2: 1.

Q.63) In a regular polygon, any interior angle exceeds the exterior angle by 120 degrees. Then, the number of diagonals of this polygon is

Correct Answer - 54

Explanation -

Let the exterior angle of the polygon be x° .

Then, interior angle = $x + 120^\circ$

Now,

Interior angle + Exterior angle = 180°

So,

$$\begin{aligned} x + (x + 120) &= 180 \\ \Rightarrow 2x + 120 &= 180 \\ \Rightarrow 2x &= 60 \\ \Rightarrow x &= 30^\circ \end{aligned}$$

For a regular polygon,

Exterior angle = $360/n$

So,

$$\begin{aligned} 360/n &= 30 \\ \Rightarrow n &= 12 \end{aligned}$$

Number of diagonals in an n-sided polygon is:

$$\begin{aligned} & n(n-3)/2 \\ &= 12(12-3)/2 \\ &= 12 \times 9/2 \\ &= 54 \end{aligned}$$

Hence, the number of diagonals is 54.

Q.64) The value of

$$1 + (1 + 1/3)(1/4) + (1 + 1/3 + 1/9)(1/16) + (1 + 1/3 + 1/9 + 1/27)(1/64) + \dots$$

is

- A. 15/13
- B. 16/11
- C. 27/12
- D. 15/8

Correct Answer - 16/11

Explanation -

The nth term of the series is:

$$[1 + 1/3 + 1/3^2 + \dots + 1/3^{n-1}] \times (1/4)^{n-1}$$

Now, the bracketed part is the sum of n terms of a GP with:

First term = 1

Common ratio = 1/3

So,

$$\begin{aligned}\text{Sum} &= [1 - (1/3)^n] / [1 - 1/3] \\ &= (3/2)[1 - (1/3)^n]\end{aligned}$$

Therefore,

$$\begin{aligned}T_n &= (3/2)1 - (1/3)^{nn-1} \\ &= (3/2)(1/4)^{n-1} - (3/2)(1/3)^n(1/4)^{n-1} \\ &= (3/2)(1/4)^{n-1} - (1/2)(1/12)^{n-1}\end{aligned}$$

Hence, the infinite series becomes:

$$S = (3/2)[1 + 1/4 + 1/4^2 + \dots] - (1/2)[1 + 1/12 + 1/12^2 + \dots]$$

Using sum of infinite GP:

$$\begin{aligned}&= (3/2) \times [1/(1 - 1/4)] - (1/2) \times [1/(1 - 1/12)] \\ &= (3/2) \times (4/3) - (1/2) \times (12/11) \\ &= 2 - 6/11 \\ &= 16/11\end{aligned}$$

Hence, the value of the series is 16/11.

Q.65) Let $a_n = 46 + 8n$ and $b_n = 98 + 4n$ be two sequences for natural numbers $n \leq 100$. Then, the sum of all terms common to both the sequences is

- A. 15000
- B. 14900
- C. 14602
- D. 14798

Correct Answer - 14900

Explanation -

Given,

$$a_n = 46 + 8n$$

and

$$b_n = 98 + 4m$$

To find common terms, equate them:

$$46 + 8n = 98 + 4m$$

$$\Rightarrow 8n - 4m = 52$$

$$\Rightarrow 2n - m = 13$$

Now, taking the smallest natural number solution:

$$n = 7, m = 1$$

So,

$$a_7 = b_1 = 102$$

Hence, all common terms form the sequence:

102, 110, 118, ...

which is an A.P. with common difference 8.

Now,

$$a_{100} = 46 + 8(100) = 846$$

$$b_{100} = 98 + 4(100) = 498$$

Therefore, the largest common term cannot exceed 498.

The largest term of the form $102 + 8k$ less than or equal to 498 is:

$$494$$

So, the common terms are:

$$102, 110, 118, \dots, 494$$

Number of terms:

$$= [(494 - 102)/8] + 1$$

$$= 392/8 + 1$$

$$= 49 + 1$$

$$= 50$$

Sum of the A.P.:

$$= (50/2)(102 + 494)$$

$$= 25 \times 596$$

$$= 14900$$

Hence, the sum of all common terms is 14900.

Q.66) 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

Correct Answer - 3

Explanation -

Let,

$$a = 3x + 2y$$

and

$$b = 2x - 5y$$

We try to express $19x$ in terms of a and b .

Now,

$$\begin{aligned} 5a + 2b &= 5(3x + 2y) + 2(2x - 5y) \\ &= 15x + 10y + 4x - 10y \\ &= 19x \end{aligned}$$

Given,

$$f(3x + 2y, 2x - 5y) = 19x$$

So,

$$f(a, b) = 5a + 2b$$

Now,

$$\begin{aligned} f(x, 2x) &= 5x + 2(2x) \\ &= 5x + 4x \\ &= 9x \end{aligned}$$

Given,

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

Therefore,

$$9x = 27$$
$$\Rightarrow x = 3$$

Hence, the required value of x is 3 .



shiksha