CAT 2025 Slot 1

Question Paper with Solutions

SECTION I - VERBAL ABILITY & READING COMPREHENSION (VARC)

Q1. Five jumbled 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 out and key in the number of that sentence as your answer.

1. Developments both technological and sociocultural have afforded us far greater freedom over death than we had in the past, and while we are still adapting ourselves to that freedom, we now appreciate the moral importance of this freedom.
2. But I believe that a type of freedom we can call freedom over death that is, a freedom in which we shape the timing and circumstances of how we die should be central to this conversation.
3. Legalising assisted dying is but a further step in realising this freedom over death.
4. Many people endorse, through their opinions or their choices, our freedom over death, encompassing a right to medical assistance in hastening our deaths.
5. Freedom is a notoriously complex and contested philosophical notion, and I won't pretend to settle any of the big controversies it raises.

Answer: 4

Solution:

Sentences 5, 1, 2, and 3 form a coherent progression;
Sentence 5 opens with the acknowledgement that freedom is a philosophically complex notion. Sentence 1 then zeroes in on freedom over death and contextualises it historically and morally, sentence 2 argues this freedom should be central to the ongoing debate and sentence 3 presents legalising assisted dying as a concrete step toward realising that freedom.

Sentence 4 breaks this logical chain. Instead of advancing the author's philosophical argument, it makes a factual observation about what many people endorse in practice introducing public opinion rather than continuing the conceptual thread. It therefore does not belong and is the odd sentence out.

Instructions for Questions 2–5:

The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Often the well-intentioned music lover or the traditionally-minded professional composer asks two basic questions when faced with the electronic music phenomenon: (1) is this type of artistic creation music at all? and (2) given that the product is accepted as music of a new type or order, is not such music "inhuman"? As Lejaren Hiller points out in his book Experimental Music (co-author Leonard M. Isaacson), two questions which often arise when music is discussed are: (a) the substance of musical communication and its symbolic and semantic significance, if any, and (b) the particular processes, both mental and technical, which are involved in creating and responding to musical composition. The ever-present popular concept of music as a direct, open, emotional expression and as a subjective form of communication from the composer is, of course, still that of the nineteenth century, when composers themselves spoke of music in those terms. But since the third decade of our century many composers

have preferred more objective definitions of music, epitomized in Stravinsky's description of it as "a form of speculation in terms of sound and time". An acceptance of this more characteristic twentieth-century view of the art of musical composition will of course immediately bring the layman closer to an understanding of, and sympathetic response to, electronic music, even if the forms, sounds and approaches it uses will still be of a foreign nature to him.

A communication problem, however, will still remain. The principal barrier that electronic music presents at large, in relation to the communication process, is that composers in this medium are employing a new language of forms where terms like 'densities', 'indefinite pitch relations', 'dynamic serialization', 'permutation', etc., are substitutes (or remote equivalents) for the traditional concepts of harmony, melody, rhythm, etc. When the new structural procedures of electronic music are at last fully understood by the listener the barriers between him and the work he faces will be removed.

The medium of electronic music has of course tempted many kinds of composers to try their hand at it. But the serious-minded composer approaches the world of electronic music with a more sophisticated and profound concept of creation. Although he knows that he can reproduce and employ melodic, rhythmic patterns and timbres of a traditional nature, he feels that it is in the exploration of sui generis languages and forms that the aesthetic magic of the new medium lies. And, conscientiously, he plunges into this search.

The second objection usually levelled against electronic music is much more innocent in nature. When people speak sometimes very vehemently of the 'inhuman' quality of this music they seem to forget that the composer is the one who fires the machines, collects the sounds, manipulates them, pushes the buttons, programs the computer, filters the sounds, establishes pitches and scales, splices tape, thinks of forms, and rounds up the overall structure of the piece, as well as every detail of it.

Q2. The goal of the author over the course of this passage is to:

A) differentiate the modern composer from the nineteenth-century composer
B) differentiate between electronic music and other forms of music
C) defend the "serious-minded composer" from Lejaren Hiller and Stravinsky
D) defend electronic music from certain common charges

Answer: D

Solution:

Option A is incorrect because the author does not set out to contrast modern and nineteenth-century composers as his primary goal. Option B is incorrect because the author does not distinguish electronic music from other genres he defends it.

Option C is a minor sub-point, not the main aim. Option D best captures the author's purpose: the passage opens with two common objections to electronic music (that it is not music and that it is inhuman) and then systematically responds to both. Everything the author says about twentieth-

century conceptions of music, the communication barrier, the composer's active role is directed at refuting those charges.

Q3. What relation does the "communication problem" mentioned in paragraph 2 have to the questions that the author recounts at the beginning of the passage?

A) Unfamiliar forms and terms might get in the way of our seeing electronic music as music, but this can be overcome.

B) Its unfamiliar "language of forms" and novel terms mean that we cannot see electronic music as music since it does not employ traditional musical concepts.

C) None; they are unrelated to one another and form parts of different discussions.

D) The communication problem is what allows us to see electronic music as music because music must be difficult to understand.

Answer: A

Solution:

The communication problem relates directly to the opening question of whether electronic music qualifies as music at all. The author explains that the difficulty arises because electronic music uses an unfamiliar vocabulary of forms densities, dynamic serialisation, etc. rather than the traditional concepts of harmony, melody, and rhythm.

However, he immediately clarifies that once listeners become familiar with these new structural procedures, the barrier will dissolve. Option A captures this nuanced position: the problem is real but temporary and surmountable. Option B overstates the case by claiming the barrier is permanent. Options C and D are clearly inconsistent with the passage.

Q4. The mention of Stravinsky's description of music in the first paragraph does all the following EXCEPT:

A) help us determine which sounds are musical and which are not

B) respond to and expand upon earlier understandings of music

C) complicate our notion of what is communicated through music

D) allow us to classify electronic music as music

Answer: A

Solution:

Stravinsky's definition of music as "a form of speculation in terms of sound and time" is presented to illustrate a more objective, twentieth-century view of the art.

This definition (B) responds to and expands beyond the nineteenth-century view of music as personal emotional expression. It (C) complicates our notion of musical communication by shifting focus from emotion to structure and speculation. It (D) allows electronic music to qualify as music because electronic compositions clearly engage with sound and time in a speculative manner.

However, Stravinsky's definition does NOT (A) tell us which sounds are musical and which are not it is a broad philosophical statement, not a criterion for sorting sounds. Option A is therefore the correct answer.

Q5. From the context in which it is placed, the phrase "sui generis" in paragraph 3 suggests which one of the following?

A) Particular
B) Generic
C) Unaesthetic
D) Indescribable

Answer: A

Solution:

In paragraph 3 the author says the serious-minded composer feels that the "aesthetic magic of the new medium" lies in exploring "sui generis languages and forms." The phrase is used to describe something that is uniquely its own distinct and one-of-a-kind rather than derived from an existing tradition.

Option A (Particular / unique to itself) fits perfectly. Option B (Generic) means the opposite common or typical. Options C and D introduce ideas (unaesthetic, indescribable) that are not suggested by the context.

Q6. 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. It can in fact be integrated into any function (education, medical treatment, production, punishment); it can increase the effect of this function, by being linked closely with it; it can constitute a mixed mechanism in which relations of power (and of knowledge) may be precisely adjusted, in the smallest detail, to the processes that are to be supervised; it can establish a direct proportion between 'surplus power' and 'surplus production'.
2. It's a case of 'it's easy once you've thought of it' in the political sphere.
3. The panoptic mechanism is not simply a hinge, a point of exchange between a mechanism of power and a function; it is a way of making power relations function in a function, and of making a function through these power relations.
4. In short, it arranges things in such a way that the exercise of power is not added on from the outside, like a rigid, heavy constraint, to the functions it invests, but is so subtly present in them as to increase their efficiency by itself increasing its own points of contact.

Answer: 2143

Solution:

The correct order is 2 → 1 → 4 → 3. Sentence 2 opens with an informal remark that situates the idea in the political sphere and signals that the insight is simple once grasped. Sentence 1 then expands on what the mechanism can do in concrete functional terms integrating into education, medicine, production, and punishment. Sentence 4 follows logically, summarising with "In short" that power is embedded within functions rather than imposed from outside.

Sentence 3 closes the sequence at the most abstract level, giving the formal theoretical definition of the panoptic mechanism as a way for power and function to operate through each other. The movement is from casual observation → concrete effects → concise summary → theoretical definition.

Q7. The given sentence is missing in the paragraph below. Decide where it best fits among the options 1, 2, 3, or 4 indicated in the paragraph.

Sentence: "Everything is old-world, traditional techniques from Mexico," Ava emphasizes.

The sisters embrace the ways their great-grandfather built and repaired instruments. __(1)__. When crafting a Mexican guitarrón used in mariachi music, they use tacote wood for the top of the instrument. Once the wood is cut, they carve the neck and heel from a single block using tools like hand saws, chisels and sandpaper rather than modern power tools and believe that this traditional method improves the tone of the instrument. __(2)__. Their store has a three-year waitlist for instruments that take months to create. __(3)__. The family's artisanship has attracted stars like Los Lobos, who own custom guitars made by all three generations of the Delgado family. _(4)_. For the sisters, involvement in the family business started at an early age. They each built their first instruments at age 9.

A) Option 1

B) Option 4

C) Option 2

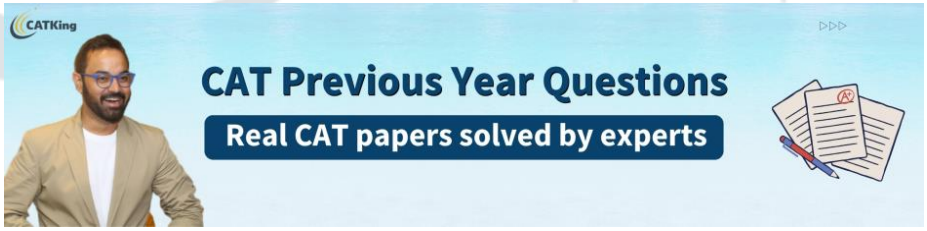
D) Option 3

Answer: A (Option 1)

Solution:

The missing sentence is Ava's direct quotation affirming that their techniques are entirely old-world and rooted in Mexican tradition. It fits best immediately after the opening line "The sisters embrace the ways their great-grandfather built and repaired instruments" because it gives Ava's own voice to what "embracing those ways" actually means before the paragraph moves into specific technical details about wood selection, tools, and carving methods.

Placing the sentence at position 1 allows the quotation to serve as an introduction to everything that follows. At positions 2, 3, or 4 it would interrupt either the technical description or the discussion of the store's success and the family's generational reputation.



Q8. The given sentence is missing in the paragraph below. Decide where it best fits among the options 1, 2, 3, or 4 indicated in the paragraph.

Sentence: Historically, silver has been, and still is, an important element in the business of 'show' visible in private houses, churches, government and diplomacy.

____(1)____. Timothy Schroder put it succinctly in suggesting that electric light and eating in the kitchen eroded this need. As he explained to the author, 'Silver, when illuminated by flickering candlelight, comes alive and almost dances before the eyes, but when lit by electric light, it becomes flat and dead.' ____(2)____. Domestic and economic changes may have worked against the market, but the London silver trade remained buoyant, thanks to the competition of collectors seeking grand display silver at the top end, and the buyers of 'collectables', like spoons and wine labels and 'novelties', at the bottom.

____(3)____. Another factor that came into play was the systematic collection building of certain American museums over the period. Boston, Huntington Art Gallery and Williamsburg, among others, were largely supplied by London dealers. ____(4)____.

A) Option 4
B) Option 3
C) Option 1
D) Option 2

Answer: B (Option 3)

Solution:

The missing sentence establishes silver's long-standing role as an instrument of display in a variety of prestigious settings. This context is most needed at position 3, just before the paragraph pivots to discussing American museum acquisitions.

At that point the reader benefits from a reminder of silver's enduring prestige value in order to understand why institutions such as the Boston Museum and the Huntington Art Gallery were actively building silver collections.

Position 1 does not work well because the decline of silver's domestic prominence (discussed through Schroder's remark) has not yet been introduced. Position 2 interrupts a quotation and its immediate context. Position 4 arrives too late, after the museum point has already been made.

Instructions for Questions 9–12: The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Understanding the key properties of complex systems can help us clarify and deal with many new and existing global challenges, from pandemics to poverty. A recent study in Nature Physics found transitions to orderly states such as schooling in fish (all fish swimming in the same direction), can be caused, paradoxically, by randomness, or 'noise' feeding back on itself. That is, a misalignment among the fish causes further misalignment, eventually inducing a transition to schooling. Most of us wouldn't guess that noise can produce predictable behaviour. The result invites us to consider how technology such as contact-tracing apps, although informing us locally, might negatively impact our collective movement. If each of us changes our behaviour to avoid the infected, we might generate a collective pattern we had aimed to avoid: higher levels of interaction between the infected and susceptible, or high levels of interaction among the asymptomatic.

Complex systems also suffer from a special vulnerability to events that don't follow a normal distribution or 'bell curve'. When events are distributed normally, most outcomes are familiar and don't seem particularly striking. Height is a good example: it's pretty unusual for a man to be over 7 feet tall; most adults are between 5 and 6 feet, and there is no known person over 9 feet tall. But in collective settings where contagion shapes behaviour a run on the banks, a scramble to buy toilet paper the probability distributions for possible events are often heavy-tailed. There is a much higher probability of extreme events, such as a stock market crash or a massive surge in infections. These events are still unlikely, but they occur more frequently and are larger than would be expected under normal distributions.

What's more, once a rare but hugely significant 'tail' event takes place, this raises the probability of further tail events. We might call them second-order tail events; they include stock market gyrations after a big fall and earthquake aftershocks. The initial probability of second-order tail events is so tiny it's almost impossible to calculate but once a first-order tail event occurs, the rules change, and the probability of a second-order tail event increases.

The dynamics of tail events are complicated by the fact that they result from cascades of other unlikely events. When COVID-19 first struck, the stock market suffered stunning losses followed by an equally stunning recovery. Some of these dynamics are potentially attributable to former sports bettors, with no sports to bet on, entering the market as speculators rather than investors. The arrival of these new players might have increased inefficiencies and allowed savvy long-term investors to gain an edge over bettors with different goals.

One reason a first-order tail event can induce further tail events is that it changes the perceived costs of our actions and changes the rules that we play by. This game-change is an example of another key complex systems concept: nonstationary. A second, canonical example of nonstationary is adaptation, as illustrated by the arms race involved in the co-evolution of hosts and parasites in which each has to 'run' faster, just to keep up with the novel solutions the other one presents as they battle it out in evolutionary time.

Q9. All of the following inferences are supported by the passage EXCEPT that:

A) examples like runs on banks and toilet-paper scrambles illustrate how contagion can amplify local choices into system-wide cascades that surprise participants and lead to patterns they did not intend to create.

B) learning can change the rules that actors face. So, a rare shock can alter payoffs and raise the odds of subsequent large disturbances within the same system, which supports the idea of second-order tail events.

C) heavy-tailed events make extreme outcomes more frequent and larger than bell-curve expectations. This complicates forecasting and risk management in collective settings shaped by contagion and copying behaviour.

D) the text attributes the COVID-19 pandemic rebound in financial markets solely to displaced sports bettors and treats their entry as the overriding cause of the rapid recovery across assets and time horizons.

Answer: D

Solution:

Options A, B, and C are all clearly supported by the passage. Option A is supported by the toilet-paper and bank-run examples in paragraph 2.

Option B is supported by the discussion of nonstationary in paragraph 5 a first-order event changes rules and payoffs, thereby raising the probability of further tail events.

Option C is supported by the heavy-tailed distribution discussion in paragraph 2.

Option D is NOT supported: the passage says only that some of the COVID-19 market dynamics are "potentially attributable" to displaced sports bettors, using hedged language that signals tentative correlation rather than definitive sole causation. The passage never claims their entry was the overriding cause of the entire recovery. Option D therefore misrepresents the passage.

Q10. Which one of the options below best summarises the passage?

A) The passage explains how social outcomes generally follow normal distributions. So, extreme events are negligible, and policy should stabilise averages rather than learn from large shocks in fast-changing collective settings.

B) The passage explains how noise can create order, then shows why complex systems with contagion are vulnerable to heavy-tailed cascades. It also explains why early shocks change rules through nonstationary with a market illustration during the COVID-19 disruption.

C) The passage explains how speculative entrants always produce inefficiency after health shocks. Therefore, long-term investors invariably profit when new participants push prices away from fundamentals under pandemic conditions and comparable crises.

D) The passage explains how nonstationary works in evolutionary biology and rejects applications in markets or public health because adaptation is exclusive to parasite-host systems and cannot arise in technology-mediated social dynamics.

Answer: B

Solution:

Option B is the most accurate summary. The passage moves through a clear sequence: paragraph 1 introduces the counterintuitive idea that noise (randomness) can produce order; paragraph 2 presents the vulnerability of complex systems to heavy-tailed events; paragraphs 3–4 explain how first-order tail events trigger second-order ones, illustrated by COVID-era market behaviour; paragraph 5 ties this together with the concept of nonstationary.

Option A contradicts the passage, which argues that social outcomes are often heavy-tailed, not normal.

Option C overgeneralises a single hedged example into a universal law. Option D reverses the passage's position: the author explicitly applies nonstationary to markets and public health, not just biology.

Q11. Which one of the following observations would most strengthen the passage's claim that a first-order tail event raises the probability of further tail events in complex systems?

A) In epidemic networks, initial super-spreading episodes are isolated spikes after which outbreak sizes match the baseline distribution from independent contact models across comparable cities with no rise in the frequency or size of later extreme clusters.

B) River discharge records show water levels fit a normal distribution with thin tails that match laboratory data, regardless of storms or floods.

C) After a major equity crash, researchers find dense clusters of large daily moves for several weeks, with extreme days occurring far more often than in normal circumstances for assets with customarily low volatility profiles.

D) Following large earthquakes, regional seismic activity returns to baseline within hours with no aftershock sequence once data are adjusted for reporting effects, which suggests independence across events rather than any elevation in subsequent tail probabilities.

Answer: C

Solution:

The claim to be strengthened is that one extreme event (first-order tail event) increases the probability of subsequent extreme events. Option C directly supports this: after a major equity crash itself a first-order tail event researchers observe that extreme price movements cluster densely over the following weeks at rates far above normal.

This is precisely the pattern of second-order tail events the passage describes, and the mechanism aligns with nonstationary (the crash changes market dynamics). Options A and D both contradict the claim by describing situations where extreme events are isolated and subsequent activity reverts to baseline. Option B is irrelevant, as river discharge in a river system is not a complex contagion-driven setting.

Q12. The passage suggests that contact-tracing apps could inadvertently raise risky interactions by altering local behaviour. Which one of the assumptions below is most necessary for that suggestion to hold?

A) Most users uninstall apps within a week, which leaves only highly exposed individuals participating. This neutralises any systematic bias in routing decisions and prevents any predictable change in aggregate contact patterns.

B) Individuals base movement choices partly on observed infections and on the behaviour of others. So, local responses interact, which turns many small adjustments into large-scale patterns that can frustrate the intended aim of risk reduction.

C) App alerts always include precise location to within one metre and deliver real-time updates for all users, which ensures that the data feed is perfectly accurate regardless of privacy settings, power limits, or network conditions.

D) Urban networks have uniform traffic conditions at all hours, which allows perfectly predictable routing independent of personal choices, social signals, or crowd reactions and, therefore, makes interdependence negligible in city movement decisions.

Answer: B

Solution:

For the suggestion to hold that individual responses to app alerts aggregate into an unintended and risky collective pattern it must be true that individual movement decisions are interdependent, meaning people react not only to infection data but also to what others around them are doing.

Without this interdependence, small individual adjustments cannot compound into system-wide effects. Option B states exactly this assumption, making it necessary. Using the negation test: if individuals made movement choices independently (not responding to others' behaviour), local adjustments would not cascade into dangerous collective patterns, and the passage's suggestion would collapse.

Option A would undermine rather than support the claim. Option C concerns data accuracy, which is irrelevant to whether behaviour is interdependent. Option D, if true, would also undermine the claim by making interdependence negligible.

Q13. 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. But man, woman or otherwise, there is no denying that the quality of our life and character will be significantly shaped by the way we handle our anger.

2. Once the taboos have been broken, women usually experience letting their fists fly as intensely liberating.

3. Though this might seem a stereotype, women unlike men, who are frequently applauded for unbridled aggression are often socialized to keep a lid on their ire.

4. Many of them are so at odds with their aggressive feelings that, as a coach, I often have to stop them from pulling their punches and encourage them to extend their arms so their blows might actually reach their fleshy target.

Answer: 3421

Solution:

The correct sequence is 3 → 4 → 2 → 1. Sentence 3 establishes the core observation: women are often socialised to suppress anger, unlike men who are praised for aggression.

Sentence 4 brings in a concrete coaching example that illustrates how deeply this suppression is internalised women physically hold back their punches. Sentence 2 describes the liberating experience that follows when that trained restraint is released.

Sentence 1 then broadens the discussion beyond gender entirely, concluding with a universal statement about how handling anger shapes character and life quality for everyone. The paragraph moves from a gender-specific social observation → specific illustration → consequence of overcoming inhibition → universal principle.

Q14. The passage given below is followed by four summaries. Choose the option that best captures the essence of the passage.

Passage:
Zombie cells may contribute to age-related chronic inflammation: this finding could help scientists understand more about the aging process and why the immune system becomes less effective as we get older. Zombie or "senescent" cells are damaged cells that can no longer divide and grow like normal cells. Scientists think that these cells can contribute to chronic health problems when they accumulate in the body. In younger people, the immune system is more effective at clearing senescent cells from the body through a process called apoptosis, but as we age, this process becomes less efficient. As a result, there is an accumulation of senescent cells in different organs in the body, either through increased production or reduced clearance by the immune system. The zombie cells continue to use energy though they do not divide, and often secrete chemicals that cause inflammation, which if persistent for longer periods of time can damage healthy cells leading to chronic diseases.

A) Senescent "zombie" cells are inactive or malfunctioning cells that can be found throughout the body.

B) A younger person's immune system is healthy and is able to clear the damaged cells, but as people age, the zombie cells resist apoptosis, and start accumulating in the body.

C) Aging leads to less effective apoptosis, and therefore zombie cells start to accumulate in the body, causing inflammation, which accelerates aging and leads to chronic diseases.

D) Dead cells accelerate chronic inflammation weakening the immune system and lead to aging.

Answer: C

Solution:

Option C most accurately captures the passage's complete causal chain: (1) aging → (2) less effective apoptosis → (3) accumulation of zombie cells → (4) chronic inflammation → (5) chronic disease.

Option A is too limited it only describes what senescent cells are, omitting the aging mechanism and its consequences. Option B introduces an error: the passage attributes the accumulation to a less efficient immune system, not to zombie cells actively resisting apoptosis.

Option D confuses senescent (metabolically active but non-dividing) cells with dead cells, and incorrectly states that inflammation weakens the immune system the passage does not make this claim. Option C alone traces the full argument of the passage.

Instructions for Questions 15–18: The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

How can we know what someone else is thinking or feeling, let alone prove it in court? In his 1863 book, A General View of the Criminal Law of England, James Fitzjames Stephen, among the most celebrated legal thinkers of his generation, was of the opinion that the assessment of a person's mental state was an inference made with "little consciousness." In a criminal case, jurors, doctors, and lawyers could watch defendants scrutinizing clothing, mannerisms, tone of voice but the best they could hope for were clues. Rounding these clues up to a judgment about a defendant's guilt, or a defendant's life, was an act of empathy and imagination. The closer the resemblance between defendants and their judges, the easier it was to overlook the gap that inference filled. Conversely, when a defendant struck officials as unlike themselves, whether by dint of disease, gender, confession, or race, the precariousness of judgments about mental state was exposed.

In the nineteenth century, physicians who specialized in the study of madness and the care of the insane held themselves out as experts in the new field of mental science. Often called alienists or mad doctors, they were the predecessors of modern psychiatrists, neurologists, and psychologists. The opinions of family and neighbours had once been sufficient to sift the sane from the insane, but a growing belief that insanity was a subtle condition that required expert, medical diagnosis pushed physicians into the witness box. Lawyers for both prosecution and defence began to recruit alienists to assess defendants' sanity and to testify to it in court.

Irresponsibility and insanity were not identical, however. Criminal responsibility was a legal concept and not, fundamentally, a medical one. Stephen explained: "The question 'What are the mental elements of

responsibility?' is, and must be, a legal question. It cannot be anything else, for the meaning of responsibility is liability to punishment." Nonetheless, medical and legal accounts of what it meant to be mentally sound became entangled and mutually referential throughout the nineteenth century. Lawyers relied on medical knowledge to inform their opinions and arguments about the sanity of their clients. Doctors commented on the legal responsibility of their patients. Ultimately, the fields of criminal law and mental science were both invested in constructing an image of the broken and damaged psyche that could be contrasted with the whole and healthy one. This shared interest, and the shared space of the criminal courtroom, made it nearly impossible to consider responsibility without medicine, or insanity without law.

Physicians and lawyers shared more than just concern for the mind. Class, race, and gender bound these middle-class, white, professional men together, as did family ties, patriotism, Protestantism, business ventures, the alumni networks of elite schools and universities, and structures of political patronage. But for all their affinities, men of medicine and law were divided by contests over the borders of criminal responsibility, as much within each profession as between them. Alienists steadily pushed the boundaries of their field, developing increasingly complex and capacious definitions of insanity. Eccentricity and aggression came to be classified as symptoms of mental disease, at least by some.

Q15. The last paragraph of the passage refers to "middle-class, white, professional men". Which one of the following qualities best describes the connection among them?

A) The borders of criminal responsibility.

B) The opinions of family and neighbours.

C) Eccentricity and aggression.

D) Empathy and imagination.

Answer: A

Solution:

Although the last paragraph lists many social ties binding these professional men class, religion, schools, family networks it specifically identifies what divided and therefore most centrally connected them professionally: contests over the borders of criminal responsibility.

The passage states that "for all their affinities, men of medicine and law were divided by contests over the borders of criminal responsibility, as much within each profession as between them." This professional tension over where criminal responsibility begins and ends is the defining thread of their relationship.

Options B and D refer to ideas from earlier paragraphs and not to the professional bond discussed in the final paragraph. Option C describes a development within alienism (expanding definitions of insanity) rather than the shared connection between physicians and lawyers.

Q16. According to the passage, who or what was an "alienist"?

A) Professionals who pushed the boundaries of their fields till they became unrecognisable in the nineteenth century.

B) Physicians who specialised in the study of madness and the care of the insane in the nineteenth century.

C) Physicians and lawyers who were responsible for the condition of immigrants or 'aliens' in the nineteenth century.

D) Physicians and lawyers who were responsible for examining accounts of extraterrestrials or 'aliens' in the nineteenth century.

Answer: B

Solution:

The passage provides an explicit definition in paragraph 2: "physicians who specialized in the study of madness and the care of the insane" were "often called alienists or mad doctors" and were the predecessors of modern psychiatrists, neurologists, and psychologists.

Option B matches this definition exactly. Option A is too vague and omits the medical specialisation. Options C and D are entirely fabricated the term has nothing to do with immigrants or extraterrestrials. The word 'alienist' derives from the French alienist, used in the context of mental alienation (estrangement from reason), not from the modern colloquial sense of 'alien.'

Q17. Study the following sets of concepts and identify the set that is conceptually closest to the concerns and arguments of the passage.

A) Empathy, Prosecution, Knowledge, Business.

B) Judgement, Belief, Accounts, Patronage.

C) Assessment, Empathy, Prosecution, Patriotism.

D) Judgement, Insanity, Punishment, Responsibility.

Answer: D

Solution:

The passage is centrally about how mental states are assessed in legal settings, the relationship between insanity and criminal law, the meaning of responsibility as liability to punishment, and the judgements made by juries, doctors, and lawyers.

Option D Judgement, Insanity, Punishment, Responsibility maps directly onto these themes. Judgement refers to the inferences made about mental states; Insanity is the medical concept that physicians brought into court; Punishment is Stephen's definition of what responsibility entails; Responsibility is the overarching legal concept the passage investigates.

Options A, B, and C each include terms that are only tangentially relevant (Business, Patronage, Patriotism) and omit the core concepts of insanity and punishment.

Q18. "Conversely, when a defendant struck officials as unlike themselves, whether by dint of disease, gender, confession, or race, the precariousness of judgments about mental state was exposed." Which one of the following best describes the use of the word "confession" in this sentence?

A) Referring to the practice of 'confession' in some faiths, here it is a metaphor for the religion of the defendant.

B) Referring to the gender, race or disease claimed as a defence by the defendant, here it is a synonym for 'professing' a gender, race, or disease.

C) Referring to the defendant's confession of his or her crime as false, because 'dint' is an archaic form of 'didn't' or 'did not'.

D) The defendants struck out at the officials and then confessed to the act.

Answer: A

Solution:

In the sentence, the word 'confession' appears alongside disease, gender, and race as characteristics that made a defendant seem unlike the officials judging them. In nineteenth-century England, religious affiliation one's faith or 'confession' was a significant marker of social identity and difference.

The term here most likely refers to religious confession (denomination), echoing the period's deep divisions between Protestantism and other faiths. When a defendant's religious identity differed from that of the judges, it contributed to perceptions of strangeness that exposed the fragility of mental-state judgements.

Option B misreads 'confession' as synonymous with 'professing a characteristic,' which is grammatically and contextually implausible. Options C and D are textually unsupported.

Q19. Five jumbled 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 out and key in the number of that sentence as your answer.

1. The Bayeux Tapestry was, therefore, an obvious way to tell people about the downfall of the English and the rise of the Normans.
2. So if we take expert in Anglo-Saxon culture Gale Owen-Crocker's idea that the tapestry was originally hung in a square with certain scenes facing each other, people would have stood in the centre.
3. Art historian Linda Neagley has argued that pre-Renaissance people interacted with art visually, kinaesthetically (sensory perception through bodily movement) and physically.
4. That would make it an 11th-century immersive space with scenes corresponding and echoing each other, drawing the viewer's attention, playing on their senses and understanding of the story they thought they knew.
5. The Bayeux Tapestry would have been hung at eye level to enable this.

Answer: 1

Solution:

Sentences 3, 2, 5, and 4 form a coherent paragraph about how the Bayeux Tapestry was likely displayed and experienced by medieval viewers. Sentence 3 introduces Neagley's argument that pre-Renaissance people engaged with art visually, kinaesthetically, and physically.

Sentence 2 builds on this with Owen-Crocker's idea that the tapestry may have been arranged in a square so viewers stood at the centre. Sentence 5 adds the practical detail that the tapestry would have been hung at eye level to enable this full-body engagement. Sentence 4 then draws the conclusion: such an arrangement would create an 11th-century immersive environment.

Sentence 1 introduces a completely different idea the tapestry as political communication about the Norman Conquest which does not connect to the argument about viewer experience and spatial arrangement developed by the other four sentences. It is therefore the odd sentence out.

Instructions for Questions 20–23: The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Studies showing that income inequality plays a positive role in economic growth are largely based on three arguments. The first argument focuses on investment indivisibilities wherein large sunk costs are required when implementing new fundamental innovations. Without stock markets and financial institutions to mobilize large sums of money, a high concentration of wealth is needed for individuals to undertake new industrial activities accompanied by high sunk costs. [One study] shows the relation between economic growth and income inequality for 45 countries during 1966–1995. It was found that the increase in income inequality has a significant positive relationship with economic growth in the short and medium term. Using system GMM, [another study] estimated the relation between income inequality and economic growth for 106 countries during 1965–2005. The results show that income inequality has a positive impact on economic growth in the short run, but the two are negatively correlated in the long run. The second argument is related to moral hazard and incentives. Because economic performance is determined by the unobservable level of effort that agents make, paying compensations without taking into account the economic performance achieved by individual agents will fail to elicit optimum effort from the agents. Thus, certain income inequalities contribute to growth by enhancing worker motivation and by giving motivation to innovators and entrepreneurs. Finally, [another study] points out that the concentration of wealth or stock ownership in relation to corporate governance contributes to growth. If stock ownership is distributed and owned by a large number of shareholders, it is not easy to make quick decisions due to the conflicting interests among shareholders, and this may also cause a free-rider problem in terms of monitoring and supervising managers and workers.

Various studies have examined the relationships between income inequality and economic growth, and most of these assert that a negative correlation exists between the two. Analysing 159 countries for 1980–2012, they conclude that there exists a negative relation between income inequality and economic growth; when the income share of the richest 20% of population increases by 1%, the GDP decreases by 0.08%, whereas when the income share of the poorest 20% of population increases by 1%, the GDP increases by 0.38%. Some studies find that inequality has a negative impact on growth due to poor human capital accumulation and low fertility rates, while [others] point out that inequality creates political instability, resulting in lower investment. [Some economists] argue that widening income inequality has a negative impact on economic growth because it negatively affects social consensus or social capital formation. One important research topic is the correlation between democratization and income redistribution. [Some scholars] explain that social pressure for income redistribution rises as income inequality increases in a democratic society. In other words, when democratization extends suffrage to a wider class of people, the increased political power of low- and middle-income voters results in broader support for income redistribution and social welfare expansion. However, if the rich have more political influence than the poor, the democratic system actually worsens income inequality rather than improving it.

Q20. Which one of the options below best summarises the passage?

A) The passage claims that evaluating the effect of income inequality on economic growth without considering both short- and long-term consequences is misguided.

B) The passage confines its discussion to financing gaps and corporate control while undercutting cross-country evidence and overlooking the significance of concerns regarding human capital accumulation, fertility rates, and income redistribution under democratisation.

C) The passage argues that income inequality accelerates economic growth while also emphasising the significance of concerns regarding human capital accumulation, fertility rates, and political instability.

D) The passage outlines investment, incentive, and governance channels through which income inequality may support economic growth and reports short-term gains while noting long-term drawbacks.

Answer: D

Solution:

The passage is structured in two halves: the first presents three pro-inequality arguments (investment indivisibilities, incentive effects, concentrated corporate governance), supported by cross-country data showing short- and medium-term growth benefits; the second presents a body of evidence showing that inequality is negatively associated with long-run growth through channels such as poor human capital, political instability, and weakened social capital.

Option D accurately captures both halves naming the three growth-supporting channels and acknowledging the long-run reservations. Option A identifies only one feature (short vs. long term). Option B incorrectly claims the passage ignores human capital and fertility rates, which are explicitly discussed in paragraph 2. Option C falsely implies the passage takes an advocacy position for inequality.

Q21. The passage refers to "democratization". Choose the one option below that comes closest to the opposite of this process.

A) After the emergency decree, the regime shifted toward authoritarianism as suffrage narrowed and opposition parties were deregistered.

B) Corporate donations were capped and parties received public funding which was portrayed as establishing an oligarchy.

C) Municipalities adopted participatory budgeting and recall elections which a press release called totalitarianism.

D) The coalition imposed term limits and strengthened judicial review in order to further entrench autocratic rule.

Answer: A

Solution:

The passage defines democratisation as extending suffrage to a wider class of people, thereby increasing the political power of lower- and middle-income voters. The direct opposite of this process is a contraction of voting rights and political participation that is, authoritarianism. Option A describes exactly this: an emergency decree leading to narrowed suffrage and the deregistration of opposition parties, which is a textbook reversal of democratisation.

Option B describes campaign finance reform, which can coexist with democracy. Option C describes genuinely democratic mechanisms (participatory budgeting, recall elections) the label 'totalitarianism'

in a press release does not change their nature. Option D introduces term limits and judicial review, which are generally tools of democratic governance, not authoritarianism.

Q22. The primary function of the three-part case for a positive income inequality–economic growth link in the first half of the passage is to show that:

A) inequality boosts growth in every period and type of economy, regardless of finance or governance conditions.

B) mature stock markets make wealth concentration unnecessary, yet they might still be harmful to investment.

C) inequality can aid short-term growth in settings with high sunk costs, incentive alignment, and concentrated ownership.

D) dispersed ownership speeds corporate decision-making and removes free-rider problems.

Answer: C

Solution:

The three-part case investment indivisibilities, incentive/moral hazard effects, and concentrated corporate governance is explicitly conditional: it applies in situations where large sunk costs are present, where pay cannot easily be linked to unobservable effort, and where ownership concentration aids governance. The studies cited also show that the positive relationship holds in the short and medium term but reverses in the long run.

Option C captures these conditionalities precisely. Option A overgeneralises the claim by removing all conditions and time horizons. Option B distorts the investment-indivisibilities argument, which says concentrated wealth is needed when stock markets are absent or underdeveloped, not that mature markets harm investment. Option D directly contradicts the governance argument, which warns that dispersed ownership causes free-rider problems.

Q23. According to the incentive or moral hazard argument, which one of the designs below is most consistent with the claim that some inequality can raise growth?

A) Pay rewards on verifiable performance for highly productive workers.

B) Rents protected by market power that enlarge top incomes without linking pay to results.

C) Wages are determined by tenure rather than output to ensure equity.

D) A regime that concentrates stock ownership in relation to corporate governance.

Answer: A

Solution:

The moral hazard / incentive argument in the passage states that economic performance is determined by unobservable effort levels; paying compensation without regard to performance fails to elicit optimal

effort. Therefore, linking pay to results is the mechanism through which inequality motivates workers and entrepreneurs and thereby raises growth.

Option A is the only design that does this: rewarding verifiable performance creates inequality (high performers earn more) that is tied directly to productive output. Option B creates inequality through rent-seeking without any performance link this does not address moral hazard. Option C eliminates performance incentives by tying wages to tenure alone. Option D relates to the corporate governance argument (the third mechanism), not the incentive argument.

Q24. The passage given below is followed by four summaries. Choose the option that best captures the essence of the passage.

Passage: In the dynamic realm of creativity, artists often find themselves at the crossroads between drawing inspiration from diverse cultures and inadvertently crossing into the territory of cultural appropriation. Inspiration is the lifeblood of creativity, driving artists to create works that resonate across borders. The globalized nature of the modern world invites artists to draw from a vast array of cultural influences. When approached respectfully, inspiration becomes a bridge, fostering understanding and appreciation of cultural diversity. However, the line between inspiration and cultural appropriation can be thin and easily blurred. Cultural appropriation occurs when elements from a particular culture are borrowed without proper understanding, respect, or acknowledgement. This leads to the commodification of sacred symbols, the reinforcement of stereotypes, and the erasure of the cultural context from which these elements originated. It's essential to recognize that the impact of cultural appropriation extends beyond the realm of artistic expression, influencing societal perceptions and perpetuating power imbalances.

A) Artists in a globalised world must navigate between drawing inspiration from diverse cultures respectfully and cultural appropriation that involves borrowing without proper acknowledgement which has broader societal impacts including perpetuating power imbalances.

B) In today's world of creativity, artists have to decide between respectfully acknowledging works that are inspired by diverse cultures and appropriating elements without respect for their contexts.

C) In a globalised world, artists must draw from diverse cultural influences to create works that appeal to all, and this results in instances of both inspiration and cultural appropriation.

D) Artists must navigate the thin line between inspiration and cultural appropriation, where respectful inspiration fosters cultural understanding whereas appropriation involves borrowing without acknowledgement leading to commodification and reinforcement of stereotypes.

Answer: A

Solution:

Option A is the most complete summary. It captures the global context, distinguishes respectful inspiration from appropriation that lacks proper acknowledgement, and crucially includes the passage's emphasis on wider societal consequences perpetuating power imbalances which go beyond artistic expression.

Option B is too narrowly framed as a simple personal decision and omits the societal effects. Option C misrepresents the passage by implying that artists must inevitably draw from diverse cultures and that both inspiration and appropriation always result, which is neither the passage's argument nor its moral position. Option D captures the artistic dimension well but omits the societal impact and broader power dynamics that the passage considers essential.

SECTION II - LOGICAL REASONING & DATA INTERPRETATION (LRDI)

Instructions for Questions 25 - 28:

A round table has seven chairs around it. The chairs are numbered 1 through 7 in a clockwise direction. Four friends, Aslam (A), Bashir (B), Chhavi (C), and Davies (D), sit on four of the chairs. In the starting position, Aslam and Chhavi are sitting next to each other, while for Bashir as well as Davies, there are empty chairs on either side of the chairs they are sitting on. The friends take turns moving either clockwise or counterclockwise from their chair. The friend who has to move occupies the first empty chair in whichever direction they choose. Aslam moves first (Turn 1), followed by Bashir, Chhavi, and Davies (Turns 2, 3, and 4 respectively). Then Aslam moves again followed by Bashir, and Chhavi (Turns 5, 6, and 7 respectively).
Known information:
1. The four friends occupy adjacent chairs only at the end of Turn 2 and Turn 6.
2. Davies occupies Chair 2 after Turn 1 and Chair 4 after Turn 5, and Chhavi occupies Chair 7 after Turn 2.

Q25. What is the number of the chair initially occupied by Bashir?

Answer: 4

Solution:

Since Davies does not move in Turn 1 and Chhavi does not move in Turn 2, their positions after those turns reflect their original seats. Davies occupies Chair 2 after Turn 1, so Davies starts on Chair 2.

Chhavi occupies Chair 7 after Turn 2, so Chhavi starts on Chair 7. With Aslam and Chhavi adjacent, Aslam must start on Chair 6 (adjacent to Chair 7).

For Bashir and Davies to each have empty chairs on both sides, and given that Chairs 2, 6, and 7 are taken, Bashir must occupy Chair 4 the only remaining position where both neighbouring chairs (3 and 5) are empty.

Q26. Who sits on the chair numbered 4 at the end of Turn 3?

A) Bashir
B) Chhavi
C) Davies
D) No one

Answer: D (No one)

Solution:

Working through the turns from the starting positions (A: Chair 6, B: Chair 4, C: Chair 7, D: Chair 2):

Turn 1 (Aslam moves): Moving clockwise, Aslam goes to Chair 1.

Turn 2 (Bashir moves): For all four to be adjacent, Bashir moves anticlockwise to Chair 3.

Friends now occupy Chairs 1, 2, 3, 7 adjacent.

Turn 3 (Chhavi moves): Davies must reach Chair 4 after Turn 5 (and does not move in Turn 5), so Chair 4 must be free until Turn 4.

Chhavi therefore moves anticlockwise to Chair 6 (not Chair 4). After Turn 3 the occupied chairs are 1, 2, 3, 6. Chair 4 is empty.

Q27. Which of the chairs are occupied at the end of Turn 6?

A) Chairs numbered 4, 5, 6, and 7
B) Chairs numbered 1, 2, 3, and 4
C) Chairs numbered 2, 3, 4, and 5
D) Chairs numbered 1, 2, 6, and 7

Answer: A (Chairs 4, 5, 6, 7)

Solution:

Continuing from Turn 3 (A: 1, B: 3, C: 6, D: 2):

Turn 4 (Davies moves): Davies moves clockwise from Chair 2 to Chair 4.

Turn 5 (Aslam moves): For all four to be adjacent after Turn 6, Aslam must move anticlockwise from Chair 1 to Chair 7.

Turn 6 (Bashir moves): For adjacency to hold, Bashir moves clockwise from Chair 3 to Chair 5.

End of Turn 6 positions: A on 7, B on 5, C on 6, D on 4. Chairs 4, 5, 6, 7 are occupied all adjacent.

Q28. Which of the following BEST describes the friends sitting on chairs adjacent to the one occupied by Bashir at the end of Turn 7?

A) Chhavi only
B) Davies only
C) Chhavi and Davies
D) Aslam and Chhavi

Answer: B (Davies only)

Solution:

At the end of Turn 6 the positions are: A on Chair 7, B on Chair 5, C on Chair 6, D on Chair 4. Turn 7 is Chhavi's move. Chhavi can move either clockwise to Chair 3 or anticlockwise to Chair 4 (but Chair 4 is occupied by Davies).

So Chhavi moves clockwise to Chair 3. At the end of Turn 7: A on 7, B on 5, C on 3, D on 4. Bashir is on Chair 5. The chairs adjacent to Chair 5 are Chair 4 (Davies) and Chair 6 (empty). Only Davies is adjacent to Bashir Chhavi has moved to Chair 3.

Instructions for Questions 29–33:

At InnovateX, six employees Asha (A), Bunty (B), Chintu (C), Dolly (D), Eklavya (E), and Falguni (F) were split into two groups of three each: Elite led by Manager Kuku, and Novice led by Manager Lalu. Each employee receives a distinct integer rating from 1 to 3 within their group each quarter. An employee's score is the cumulative rating from the start of the year. At the end of each quarter, the Novice employee with the highest score is promoted to Elite, and the Elite employee with the minimum score is demoted to Novice. Ties are broken by the higher latest-quarter rating. Conditions: 1. Asha, Bunty, and Chintu were in Elite at the start of Q1. All three were in Novice at the start of Q4. 2. Dolly and Falguni

were the only employees who received the same rating in every quarter. 3. Lalu's ratings: Bunty received 1 in Q2; Asha and Dolly received 1 and 2 respectively in Q3.

Q29. What was Eklavya's score at the end of Quarter 2?

Answer: 4

Solution:

Working from the constraints: Bunty moved from Elite to Novice after Q1 (rating 1 in Q1). Dolly's constant rating must be 2 (since F takes either 1 or 3, and the group ratings are distinct).

If F's constant rating were 1, F's cumulative after Q2 would be only 2, making promotion impossible against other members so F's constant rating is 3, and F is promoted after Q1. E is therefore promoted after Q2.

In Elite during Q1, A and C receive 2 and 3 in some order. A must be demoted after Q2, so A receives 1 in Q2 with cumulative either 3 or 4. For E and C after Q2, their scores must allow C to stay in Elite and E to join. The only consistent assignment gives E a score of 4 after Q2 (ratings 1 and 3 in Q1 and Q2 respectively).

Q30. How many employees changed groups more than once up to the beginning of Quarter 4?

Answer: 0

Solution:

Tracing all group changes: B moves from Elite → Novice after Q1 (one change). A moves from Elite → Novice after Q2 (one change). F moves from Novice → Elite after Q1 and stays (one change).

E moves from Novice → Elite after Q2 and stays (one change). C moves from Elite → Novice after Q3 (one change). No employee makes more than one group change up to the start of Q4. The answer is 0.

Q31. What was Bunty's score at the end of Quarter 3?

Answer: 5

Solution:

Bunty is in Novice throughout Q2 and Q3. In Q2 Bunty receives a rating of 1 (given).

In Q3 Bunty remains in Novice alongside Asha (rating 1) and Dolly (rating 2), so Bunty receives the remaining rating of 3.

Bunty's cumulative score: Q1 rating was 1 (demoted from Elite) + Q2 rating 1 + Q3 rating 3 = 5.

Q32. For how many employees can the scores at the end of Quarter 3 be determined with certainty?

Answer: 4

Solution:

The scores that can be determined with certainty at the end of Q3 are: Bunty = 5 (ratings 1, 1, 3); Dolly = 6 (rating 2 every quarter); Falguni = 9 (rating 3 every quarter)

Eklavya = 6 (ratings determined by constraints). Asha's Q1 rating is either 2 or 3 both cases are consistent with the data, so Asha's Q3 score cannot be determined with certainty.

Similarly, Chintu's exact Q3 score depends on which of the two possible Q1 assignments holds. Therefore, exactly 4 employees' scores can be determined with certainty.

Q33. Which of the following statements is/are NECESSARILY true? I. Asha received a rating of 2 in Quarter 1. II. Asha received a rating of 1 in Quarter 2.

A) Neither I nor II
B) Both I and II
C) Only I
D) Only II

Answer: D (Only II)

Solution:

Statement I: Asha's Q1 rating can be either 2 or 3 (with Chintu taking the other). Both assignments are consistent with all constraints, so Statement I is not necessarily true.

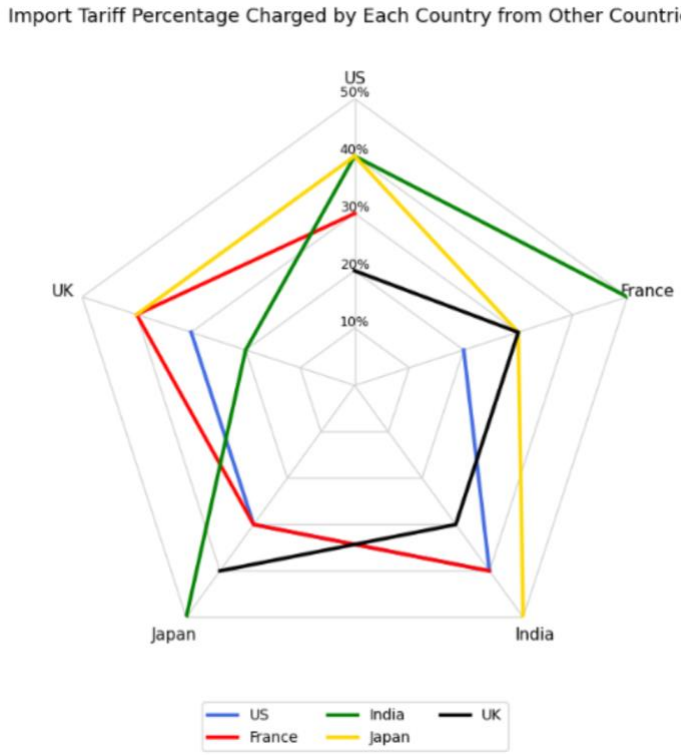
Statement II: In both possible cases (A gets 2 or 3 in Q1), for Asha to be demoted after Q2 she must receive the lowest rating in Q2 compared to Chintu.

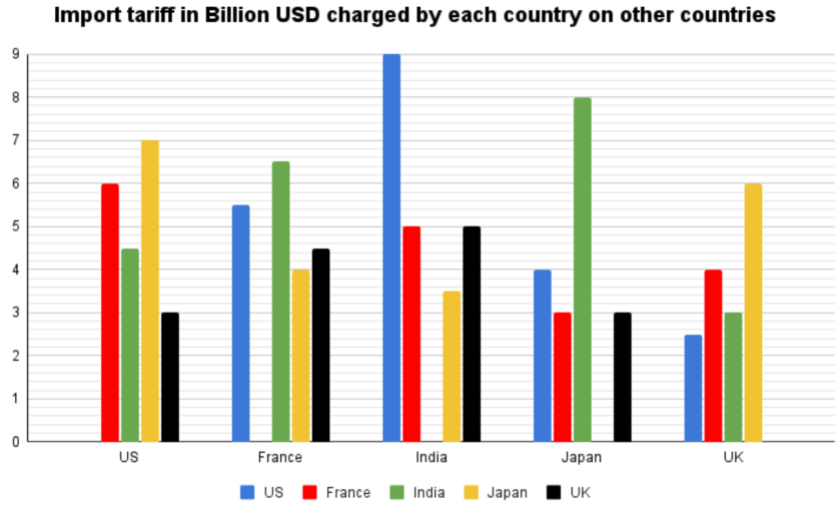
Given the way the cumulative scores work out under either assignment, Asha must receive a rating of 1 in Q2 to be demoted. Statement II is therefore necessarily true. Only II holds with certainty.

Instructions for Questions 34–37:

Five countries engage in trade with each other. Each country levies import tariffs on the other countries. The import tariff levied by Country X on Country Y is calculated by multiplying the corresponding tariff percentage with the total imports of Country X from Country Y.

The radar chart below depicts different import tariff percentages charged by each of the ve countries on the others. For example, US (the blue line in the chart) charges 20%, 40%, 30%, and 30% import tariff percentages on imports from France, India, Japan, and UK, respectively. The bar chart depicts the import tariffs levied by each county on other countries. For example, US charged import tariff of 3 billion USD on UK.





Assume that imports from one country to another equals the exports from the latter to the former.

The trade surplus of Country X with Country Y is defined as follows.

Trade surplus = Exports from Country X to Country Y - Imports to Country X from Country Y.

A negative trade surplus is called trade deficit.

Q34. How much is Japan's export to India worth?

A) 8.5 Billion USD

B) 16.0 Billion USD

C) 7.0 Billion USD

D) 1.75 Billion USD

Answer: C 7.0 Billion USD

Solution:

Japan's exports to India equal India's imports from Japan. From the charts: India charges a 50% tariff on Japan, and the tariff amount levied by India on Japan = 3.5 billion USD.

Therefore: 50% × (India's imports from Japan) = 3.5 billion USD Imports = 3.5 ÷ 0.5 = 7.0 billion USD. Japan's exports to India = 7.0 billion USD.

Q35. Which among the following is the highest?

A) Exports by Japan to UK

B) Imports by US from France

C) Exports by France to Japan

D) Imports by France from India

Answer: B Imports by US from France

Solution:

A) UK charges 40% on Japan; tariff = 6 billion USD → UK's imports from Japan = 6 ÷ 0.4 = 15 billion USD = Japan's exports to UK.

B) US charges 20% on France; tariff = 6 billion USD → US's imports from France = 6 ÷ 0.2 = 30 billion USD.

C) Japan charges 30% on France; tariff = 3 billion USD → Japan's imports from France = 3 ÷ 0.3 = 10 billion USD = France's exports to Japan.

D) France charges 40% on India; tariff = 6.5 billion USD → France's imports from India = 6.5 ÷ 0.4 = 16.25 billion USD. The highest value is 30 billion USD Option B.

Q36. What is the trade surplus/trade deficit of India with UK?

A) Surplus of 15.0 Billion USD

B) Deficit of 15.0 Billion USD

C) Surplus of 10.0 Billion USD

D) Deficit of 10.0 Billion USD

Answer: B Deficit of 15.0 Billion USD

Solution:

Exports from India to UK = UK's imports from India. UK charges 30% on India; tariff = 3 billion USD → UK's imports from India = 3 ÷ 0.3 = 10 billion USD.

Imports to India from UK = India's imports from UK. India charges 20% on UK; tariff = 5 billion USD → India's imports from UK = 5 ÷ 0.2 = 25 billion USD.

Trade surplus = Exports − Imports = 10 − 25 = −15 billion USD. This is a deficit of 15.0 billion USD.

Q37. Among France and UK, who has/have trade surplus(es) with US?

A) Neither France nor UK
B) Both France and UK
C) Only UK
D) Only France

Answer: D Only France

Solution:

France's exports to US = US's imports from France = 30 billion USD (from Q35).

France's imports from US: France charges 30% on US; tariff = 5.5 billion USD → France's imports from US = 5.5 ÷ 0.3 ≈ 18.33 billion USD.

France's trade surplus with US = 30 − 18.33 ≈ +11.67 billion USD. France has a surplus. UK's exports to US = US's imports from UK. US charges 30% on UK; tariff = 3 billion USD → US's imports from UK = 3 ÷ 0.3 = 10 billion USD.

UK's imports from US: UK charges 20% on US; tariff = 2.5 billion USD → UK's imports from US = 2.5 ÷ 0.2 = 12.5 billion USD. UK's trade balance with US = 10 − 12.5 = −2.5 billion USD. UK has a deficit.

Only France has a trade surplus with US.

Instructions for Questions 38–42:
A train travels from Station A to Station E, passing through stations B, C, and D, in that order. The train has a seating capacity of 200. A ticket may be booked from any station to any other station ahead on the route, but not to any earlier station.
A ticket from one station to another reserves one seat on every intermediate segment of the route. For example, a ticket from B to E reserves a seat in the intermediate segments B - C, C - D, and D - E.
The occupancy factor for a segment is the total number of seats reserved in the segment as a percentage of the seating capacity. The total number of seats reserved for any segment cannot exceed 200.
The following information is known.

1. Segment C - D had an occupancy factor of 95%. Only segment B - C had a higher occupancy factor.
2. Exactly 40 tickets were booked from B to C and 30 tickets were booked from B to E.
3. Among the seats reserved on segment D - E, exactly four-sevenths were from stations before C.
4. The number of tickets booked from A to C was equal to that booked from A to E, and it was higher than that from B to E.
5. No tickets were booked from A to B, from B to D and from D to E.
6. The number of tickets booked for any segment was a multiple of 10.

Q38. What was the occupancy factor for segment D–E?

A) 35%

B) 70%

C) 77%

D) 84%

Answer: B 70%

Solution:

Let tickets A→C = a, A→D = b, A→E = a (same as A→C by condition 4).

Let C→D = x, C→E = y. Segment occupancies: B–C = a + b + a + 30 + 40 = 2a + b + 70

C–D = a + b + x + y + 30 = 190 (95% of 200)

D–E = a + y + 30 (seats from A or B reaching D–E)

Since B–C > 190 and must be ≤ 200, and a multiple of 10, B–C = 200.

So 2a + b + 70 = 200 → 2a + b = 130 …(1)

From C–D: a + b + x + y = 160 …(2)

Condition 3 (4/7 of D–E seats from before C): (a + 30)/(a + y + 30) = 4/7 → a + y + 30 = 7(a + 30)/4

For this to be an integer with a multiple of 10 and a > 30: only a = 50 works (a + 30 = 80, divisible by 4).

From (1): b = 30. Substituting: y + 80 = 140 → y = 60. From (2): x = 20. D - E seats = 50 + 60 + 30 = 140. Occupancy = 140/200 = 70%.

Q39. How many tickets were booked from Station A to Station E?

Answer: 50

Solution:

From the working in Q38, a = 50. Since tickets from A→C = tickets from A→E = a = 50, the answer is 50.

Q40. How many tickets were booked from Station C?

Answer: 80

Solution:

Tickets from Station C = C→D + C→E = x + y = 20 + 60 = 80.

Q41. What is the difference between the number of tickets booked to Station C and the number of tickets booked to Station D?

Answer: 40

Solution:

Tickets booked to Station C = tickets with C as the destination = A→C + B→C = 50 + 40 = 90. Tickets booked to Station D = A→D + C→D = 30 + 20 = 50. Difference = 90 − 50 = 40.

Q42. How many tickets were booked to travel in exactly one segment?

Answer: 60

Solution:

Single-segment tickets are those covering exactly one leg of the journey: A–B: 0 (no such tickets, condition 5) B–C: 40 (given) C–D: x = 20 D–E: 0 (condition 5) Total = 0 + 40 + 20 + 0 = 60.

Instructions for Questions 43–46:

Alia, Badal, Clive, Dilshan, and Ehsaan played a game in which each asks a unique question to all the others and they respond by tapping their feet, either once or twice or thrice. One tap means “Yes”, two taps mean “No”, and three taps mean “Maybe”.

A total of 40 taps were heard across the five questions. Each question received at least one “Yes”, one “No”, and one “Maybe.”

The following information is known.

1. Alia tapped a total of 6 times and received 9 taps to her question. She responded “Yes” to the questions asked by both Clive and Dilshan.
2. Dilshan and Ehsaan tapped a total of 11 and 9 times respectively. Dilshan responded “No” to Badal.
3. Badal, Dilshan, and Ehsaan received equal number of taps to their respective questions.
4. No one responded “Yes” more than twice.
5. No one’s answer to Alia’s question matched the answer that Alia gave to that person’s question. This was also true for Ehsaan.
6. Clive tapped more times in total than Badal.

Q43. How many taps did Clive receive for his question?

Answer: 7

Solution:

Since no one can give Yes (1 tap) more than twice, the minimum total taps for any person across 4 questions is 1+1+2+2 = 6. So Badal's minimum taps = 6.

Badal + Clive = 40 − 6 − 11 − 9 = 14. With Clive > Badal and Badal ≥ 6, the only solution is Badal = 6, Clive = 8.

Alia tapped 6 times; she gave Yes (1) to Clive and Yes (1) to Dilshan. Remaining 4 taps over Badal and Ehsaan: each > 1 (no more Yes allowed), so Alia gave 2 taps to each.

Dilshan taps: A + 2 + C + E = 11 (gave No = 2 to Badal). Since Alia gets 1 from D, and maximum is 3: A=1, C=3, E=3 → sum = 1+2+3+3 = 9 ≠ 11.

Revise: all three (A, C, E taps to D) sum to 9, so each = 3. Check: 1 (Alia) + 2 (Badal) + 3 + 3 = 9 ≠ 11. Let A to D's Q = 3, then 3 + 2 + C + E = 11 → C + E = 6 → both = 3.

Badal, Dilshan, Ehsaan receive equal taps. Badal's Q receives 2+2+1+3 = 8. So each = 8. Alia's Q receives 9. Total = 9 + 8 + C's Q + 8 + 8 = 40 → Clive's Q receives 7.

Q44. Which two people tapped an equal number of times in total?

A) Badal and Dilshan

B) Clive and Ehsaan

C) Dilshan and Clive

D) Alia and Badal

Answer: D (Alia and Badal)

Solution:

From the solution to Q43: Alia's total taps = 6; Badal's total taps = 6; Clive's total taps = 8; Dilshan's total taps = 11; Ehsaan's total taps = 9. Alia and Badal both tapped 6 times.

Q45. What was Clive's response to Ehsaan's question?

A) No

B) Maybe

C) Cannot be determined

D) Yes

Answer: A (No)

Solution:

Continuing the full resolution: Alia answered Yes (1) to Clive and Yes (1) to Dilshan, and No (2) to Badal and No (2) to Ehsaan.

By condition 5, no one's answer to Alia's question matched Alia's answer to them: Badal must not give 2 to Alia → Badal gives 1 to Alia. Ehsaan must not give 2 → Ehsaan gives 3 to Alia. Clive + Ehsaan taps to Alia sum to 9 − 3 − 1 = 5, and Ehsaan = 3, so Clive = 2 to Alia.

For Ehsaan's question: condition 5 (same rule for Ehsaan) means no answer to Ehsaan's question can match Ehsaan's own answer to that person.

Dilshan gave Maybe (3) to Ehsaan → Ehsaan gave ≠ 3 to Dilshan, so Ehsaan gave 2 (No) to Dilshan. Badal to Clive's Q must be 1, otherwise Clive to Ehsaan's Q becomes 0 (impossible).

With Badal=1 to C's Q: Badal's and Ehsaan's taps to C's Q are 1 and 2 in some order. Resolving: Ehsaan taps 2 to Clive's Q, so Ehsaan's Q receives (B=1 or 3, C=?, D=2, E's own Q marked).

Full table gives Clive's response to Ehsaan = 2 = No.

Q46. How many "Yes" responses were received across all the questions?

Answer: 6

Solution:

From the complete response table constructed in the solution to Q45, the number of single-tap (Yes) responses across all five questions is 6. These include Alia's Yes to Clive and Dilshan, Badal's Yes to Alia, and three other Yes responses distributed across the remaining questions, totalling 6.

SECTION III - QUANTITATIVE ABILITY

Q47. A value of c for which the minimum value of $f(x)= x^2 - 4cx + 8c$ is greater than the maximum value of $g(x) = -x^2 + 3cx - 2c^2$ is:

A) 2
B) ½
C) −½
D) −2

Answer: B - ½

Solution:

For $f(x) = x^2 - 4cx + 8c$ (opens upward, $a > 0$):
Minimum occurs at $x = 2c \rightarrow f(2c) = 4c^2 - 8c^2 + 8c = -4c^2 + 8c$.
For $g(x) = -x^2 + 3cx - 2c^2$ (opens downward, $a < 0$): Maximum occurs at $x = 3c/2 \rightarrow g(3c/2) = -9c^2/4 + 9c^2/2 - 2c^2 = 9c^2/4 - 2c$.
Required condition: min f > max g: $-4c^2 + 8c > 9c^2/4 - 2c \quad 25c^2/4 < 10c \rightarrow 5c^2/4 < 2c \rightarrow 5c^2 - 8c < 0 \rightarrow c(c - 8/5) < 0$

Therefore $0 < c < 8/5$. Among the options, only ½ lies in this range.

Q48. Shruti travels a distance of 224 km in four parts for a total travel time of 3 hours. Her speeds follow an arithmetic progression, and the corresponding times also follow an arithmetic progression. If she travels at 960 metres per minute for 30 minutes in the first part, then the distance, in metres, she travels in the fourth part is:

A) 76800
B) 112000
C) 96000
D) 86400

Answer: D 86400

Solution:

Times are in AP with first term 30 min. Total = 180 min (3 hours). Sum of 4-term AP = 4 × first term + 6d = 180 → 120 + 6d = 180 → d = 10 min.

Times: 30, 40, 50, 60 minutes. Speeds are also in AP; first speed = 960 m/min with common difference k. Total distance = 960×30 + (960+k)×40 + (960+2k)×50 + (960+3k)×60 = 224000 m.

960(30+40+50+60) + k(40+100+180) = 224000 172800 + 320k = 224000 → k = 160 m/min. Fourth-part speed = 960 + 3×160 = 1440 m/min.

Fourth-part distance = 1440 × 60 = 86400 m.

Q49. In a 3-digit number N, the digits are non-zero and distinct such that none of the digits is a perfect square, and only one of the digits is a prime number. Then, the number of factors of the minimum possible value of N is:

Answer: 6

Solution:

Non-zero digits that are NOT perfect squares: 2, 3, 5, 6, 7, 8 (excluding 1, 4, 9). Exactly one digit must be prime. Primes in the list: 2, 3, 5, 7.

Non-primes: 6, 8.

To minimise N, choose the smallest prime (2) and the two smallest non-primes (6, 8). Smallest arrangement: 268. 268 = 4 × 67 = 2^2 × 67. Number of factors = (2+1)(1+1) = 3 × 2 = 6.

Q50. Let $3 \leq x \leq 6$, and $[x^2] = [x]^2$ where $[x]$ is the greatest integer ≤ x**.** If set S represents all feasible values of x, then a possible subset of S is:

A. $(3, \sqrt{10}) \cup [5, \sqrt{26}) \cup \{6\}$
B. $[3, \sqrt{10}] \cup [5, \sqrt{26}]$
C. $[3, \sqrt{10}] \cup [4, \sqrt{17}] \cup \{6\}$
D. $(4, \sqrt{18}) \cup [5, \sqrt{27}) \cup \{6\}$

Answer: A

Solution:

For x ∈ [n, n+1), we have [x] = n, so $[x]^2 = n^2$. The equation $[x^2] = [x]^2 = n^2$ requires $x^2 \in [n^2, n^2+1)$, i.e. x ∈ [n, √(n^2+1)).

For the interval 3 ≤ x ≤ 6: n=3: x ∈ [3, √10) n=4: x ∈ [4, √17) n=5: x ∈ [5, √26) n=6: x = 6 exactly (endpoint).

So S = [3, √10) ∪ [4, √17) ∪ [5, √26) ∪ {6}.

Option A is a valid subset: it uses (3, √10) which is ⊂ [3, √10), and [5, √26) ∪ {6} which are subsets of S.

Options B and C include √10 or √18 which fall outside S. Option D uses (4, √18) but √18 > √17, placing values outside S.

Q51. Stocks A, B and C are priced at ₹120, ₹90 and ₹150 per share respectively. A trader holds 10 shares of stock A, and 20 shares of stocks B and C combined. If the total value of her portfolio is ₹3300, then the number of shares of stock B she holds is:

Answer: 15

Solution:

Let number of B shares = x, so C shares = 20 − x. 10×120 + 90x + 150(20−x) = 3300 1200 + 90x + 3000 − 150x = 3300 4200 − 60x = 3300 → x = 15.

Q52. For any natural number k, let $a_k = 3^k$. The smallest natural number m such that $\{(a_1)^1 * (a_2)^2 * \ldots\ldots * (a_{20})^{20}\} < \{a_{21} * a_{22} * \ldots * a_{20+m}\}$, is

A) 58
B) 59
C) 56
D) 57

Answer: A 58

Solution:

Left side: $(3^1)^1 \times (3^2)^2 \times \cdots \times (3^{20})^{20} = 3^{(1^2+2^2+\ldots+20^2)} = 3^{(20 \cdot 21 \cdot 41/6)} = 3^{2870}$.

Right side: $3^{21} \times 3^{22} \times \cdots \times 3^{(20+m)} = 3^{(21+22+\cdots+(20+m))}$. 21 + 22 + ⋯ + (20+m) = (sum 1 to 20+m) − (sum 1 to 20) = (20+m)(21+m)/2 − 210. Required: (20+m)(21+m)/2 − 210 > 2870 → (20+m)(21+m) > 6160 → m(m+41) > 5740.

Testing: m=57: 57×98 = 5586 < 5740 (fails); m=58: 58×99 = 5742 > 5740 (passes).

The smallest value is m = 58.

Q53. The number of distinct integers n for which $\log_{\frac{1}{4}}(n^2 - 7n + 11) > 0$, is

A) 2
B) infinite
C) 1
D) 0

Answer: D 0

Solution:

The base is 1/4 ∈ (0,1), so $\log_{\frac{1}{4}}(t) > 0$ if and only if t ∈ (0, 1).

This requires $0 < n^2 - 7n + 11 < 1$. For an integer n, $n^2 - 7n + 11$ is itself an integer.

An integer cannot lie strictly between 0 and 1. Therefore no integer n satisfies the inequality, and the count is 0.

Q54. The number of distinct pairs of integers (x, y) satisfying x > y ≥ 3 and x + y < 14 is:

Answer: 16

Solution:

For each value of y starting from 3, count valid x values (x > y, x + y < 14 → x < 14 − y):

y = 3: x ∈ {4, 5, 6, 7, 8, 9, 10} → 7 pairs

y = 4: x ∈ {5, 6, 7, 8, 9} → 5 pairs

y = 5: x ∈ {6, 7, 8} → 3 pairs

y = 6: x ∈ {7} → 1 pair

y ≥ 7: no valid x (since x > y and x + y < 14 would require x < 14 − y ≤ 7 ≤ y, contradiction)

Total = 7 + 5 + 3 + 1 = 16.

Q55. At a certain simple rate of interest, a given sum amounts to ₹13920 in 3 years, and to ₹18960 in 6 years and 6 months. If the same sum had been invested for 2 years at the same rate but with interest compounded every 6 months, then the total interest earned, in rupees, would have been nearest to:

A) 3221

B) 3180

C) 3150

D) 3096

Answer: A 3221

Solution:

Let principal = P and simple interest rate = r% per annum. $P + P \cdot r \cdot 3/100 = 13920$ …(1)

$P + P \cdot r \cdot 6.5/100 = 18960$ …(2)

Subtracting: $P \cdot r \cdot 3.5/100 = 5040 \rightarrow Pr = 144000$.

Substituting in (1): $P + 3 \times 144000/100 = 13920 \rightarrow P + 4320 = 13920 \rightarrow P = 9600$.

Rate $r = 144000/9600 = 15\%$ per annum.

Half-yearly rate = 7.5%. Compound amount (4 half-years) $= 9600 \times (1.075)^4 \approx 9600 \times 1.3355 \approx 12821$.

Interest = 12821 − 9600 = 3221 (nearest).

Q56. A container holds 200 litres of a solution having 30% acid by volume. Atul replaces 20% of this solution with water, then replaces 10% of the resulting solution with acid, and finally replaces 15% of the solution thus obtained with water. The percentage of acid by volume in the final solution is nearest to:

A) 23

B) 25

C) 29

D) 27

Answer: D 27

Solution:

Initial acid = 0.30 × 200 = 60 L.

Step 1 Replace 20% with water: acid removed = 0.20 × 60 = 12 L.

Acid remaining = 60 − 12 = 48 L.

Step 2 Replace 10% (20 L) with pure acid: acid removed = 0.10 × 48 = 4.8 L; add back 20 L acid.

Acid = 48 − 4.8 + 20 = 63.2 L.

Step 3 Replace 15% with water: acid removed = 0.15 × 63.2 = 9.48 L. Acid = 63.2 − 9.48 = 53.72 L.

Final concentration = 53.72 / 200 ≈ 26.86% ≈ 27%.

Q57. In a class, there were more than 10 boys and a certain number of girls. After 40% of the girls and 60% of the boys left the class, the remaining number of girls was 8 more than the remaining number of boys. Then, the minimum possible number of students initially in the class was:

Answer: 55

Solution:

Let girls = g, boys = b (b > 10).

Remaining girls = 0.6g, remaining boys = 0.4b. 0.6g − 0.4b = 8 → 3g = 2b + 40 → 3g − 2b = 40. For 0.6g and 0.4b to be integers, g must be a multiple of 5 and b a multiple of 5.

Smallest solution with b > 10: b = 25, g = 30.

Total = 55. Verification: 0.6×30 = 18 girls, 0.4×25 = 10 boys.

Difference = 8.

Q58. A cafeteria offers 5 types of sandwiches. For each sandwich type, a customer can choose one of 4 breads and opt for either small or large size. Optionally, the customer may also add up to 2 out of 6 available sauces. The number of different ways in which an order can be placed is:

A) 880

B) 840

C) 800

D) 600

Answer: A 880

Solution:

Sandwich type: 5 choices × Bread: 4 choices × Size: 2 choices = 40 base combinations.

Sauces (0, 1, or 2 from 6): C(6,0) + C(6,1) + C(6,2) = 1 + 6 + 15 = 22 ways. Total = 5 × 4 × 2 × 22 = 40 × 22 = 880.

Q59. In the set of consecutive odd numbers {1, 3, 5, …, 57}, there is a number k such that the sum of all elements less than k equals the sum of all elements greater than k. Then k equals:

A) 41

B) 39

C) 43

D) 37

Answer: A 41

Solution:

The set has 29 elements (odd numbers from 1 to 57). Total sum = $29^2 = 841$.

Let k be the m-th term. Sum of terms less than k = sum of first $(m-1)$ odd numbers = $(m-1)^2$.

Sum of terms greater than k = $841 - m^2$ (total minus terms up to and including k = first m terms = m^2).

Setting them equal: $(m-1)^2 = 841 - m^2$; $m^2 - 2m + 1 = 841 - m^2$ → $2m^2 - 2m - 840 = 0$ → $m^2 - m - 420 = 0$ $(m - 21)(m + 20) = 0$ → $m = 21$. 21st odd number = $2\times21 - 1 = 41$.

Q60. Arun, Varun and Tarun, working alone, can complete a task in 24, 21, and 15 days respectively. They charge ₹2160, ₹2400, and ₹2160 per day respectively, even for partial days. If the task must be completed in 10 days or less, then the minimum possible amount, in rupees, required to pay for the entire task is:

A) 38400

B) 38880

C) 34400

D) 47040

Answer: A 38400

Solution:

Work rates: Arun = 1/24, Varun = 1/21, Tarun = 1/15 tasks per day.

Cost rates: Arun ₹2160/day, Varun ₹2400/day (most expensive), Tarun ₹2160/day (cheapest).

Strategy: Minimise cost by using the cheapest worker (Tarun) as much as possible. Tarun alone in 10 days completes 10/15 = 2/3 of the task.

Remaining 1/3 must be done in ≤ 10 days by the next cheapest worker. Both Arun and Varun cost the same or more, but Arun costs ₹2160 vs Varun's ₹2400 use Arun. Arun needs (1/3)/(1/24) = 8 days. But 10 + 8 = 18 days total not feasible if both must finish within 10 days total. Revised: Use Tarun for all 10 days (completes 2/3).

Then use Arun concurrently or overlap. If Tarun works 10 days and Arun works x days: 10/15 + x/24 = 1 → x = 8 days. If Arun works the last 8 of the 10-day window alongside Tarun for part: Tarun 10 days + Arun 7 days: 10/15 + 7/24 = 16/24 + 7/24 = 23/24 < 1. Need Arun 8 days. Optimal: Tarun works all 10 days; Arun works alongside for final stretch. Cost = 10×2160 + 7×2400 doesn't work.

Best feasible: Tarun 10 days + Arun 8 days within same 10-day window → run concurrently for 8 days. Cost = 10×2160 + 7×2400? Try: Tarun alone 10 days = 2/3 done; need Arun for additional time to reach 1. Since both must complete within 10 days: Tarun 10d + Arun 8d → total cost = 10×2160 + 8×2160 = ₹38400. Final: Pay Tarun for 10 days and Arun for 8 days within the 10-day window: ₹(10×2160) + ₹(8×2160) = ₹21600 + ₹16800 = ₹38400.

Q61. Kamala divided her investment of ₹100000 between stocks, bonds, and gold. Her investment in bonds was 25% of her investment in gold. With annual returns of 10%, 6%, 8% on stocks, bonds, and gold respectively, she gained a total of ₹8200 in one year. The amount, in rupees, that she gained from the bonds, was:

Answer: 900

Solution:

Let gold investment = G, bonds = 0.25G, stocks = 100000 − G − 0.25G = 100000 − 1.25G. 0.10(100000 − 1.25G) + 0.06(0.25G) + 0.08G = 8200 10000 − 0.125G + 0.015G + 0.08G = 8200 10000 − 0.03G = 8200 → G = 60000.

Bonds investment = 0.25 × 60000 = 15000. Gain from bonds = 0.06 × 15000 = ₹900.

Q62. If a − 6b + 6c = 4 and 6a + 3b − 3c = 50, where a, b and c are real numbers, the value of 2a + 3b − 3c is:

A) 20
B) 14
C) 18
D) 15

Answer: C 18

Solution:

We need to find scalars x, y such that x(a − 6b + 6c) + y(6a + 3b − 3c) = 2a + 3b − 3c.

Matching coefficients: a: x + 6y = 2 b: −6x + 3y = 3 → −2x + y = 1 c: 6x − 3y = −3 → 2x − y = −1 (consistent with above).

From x + 6y = 2 and −2x + y = 1: multiply second by 6: −12x + 6y = 6.

Subtract from first: 13x = −4 → x = −4/13, y = 5/13. 2a + 3b − 3c = x×4 + y×50 = (−4/13)×4 + (5/13)×50 = −16/13 + 250/13 = 234/13 = 18.

Q63. The (x, y) coordinates of vertices P, Q and R of a parallelogram PQRS are (−3, −2), (1, −5) and (9, 1) respectively. If the diagonal SQ intersects the x-axis at (a, 0), then the value of a is:

A) 27/7
B) 10/3
C) 13/4
D) 29/9

Answer: D 29/9

Solution:

In a parallelogram, opposite vertices satisfy S = P + R − Q. S = (−3, −2) + (9, 1) − (1, −5) = (5, 4).

Line SQ passes through S(5, 4) and Q(1, −5). Slope = (−5 − 4)/(1 − 5) = −9/(−4) = 9/4.

Equation: y − 4 = (9/4)(x − 5). At y = 0: −4 = (9/4)(a − 5) → −16 = 9(a − 5) → 9a = 29 → a = 29/9.

Q64. In a circle with center C and radius $6\sqrt{2}$ cm, PQ and SR are two parallel chords separated by one of the diameters. If ∠PQC= 45, and the ratio of the perpendicular distance of PQ and SR from C is 3:2, then the area, in sq. cm, of the quadrilateral PQRS is

A) 4(3 + √14)

B) 4(3√2 + √7)

C) 20(3 + √14)

D) 20(3√2 + √7)

Answer: C 20(3 + √14)

Solution:

Radius = 6√2. ∠PQC = 45°. Since PQ is a chord and CQ = 6√2, triangle PCQ is isosceles with ∠CQP = 45°, giving ∠CPQ = 45° and ∠PCQ = 90°.

By Pythagoras: $PQ^2 = PC^2 + QC^2 = (6\sqrt{2})^2 + (6\sqrt{2})^2 = 144$ → PQ = 12 cm. Distance from C to PQ: AQ = PQ/2 = 6 cm. $AC^2 + AQ^2 = CQ^2$ → $AC^2 + 36 = 72$ → AC = 6 cm. With CA : CB = 3 : 2, let CA = 3t = 6 → t = 2, CB = 4 cm. For SR: $CB^2 + BS^2 = CS^2 = (6\sqrt{2})^2$ → $16 + BS^2 = 72$ → BS = √56 = 2√14 cm. RS = 2 × BS = 4√14 cm. AB = CA + CB = 6 + 4 = 10 cm (diameter separating the chords).

Area of trapezium PQRS = ½ × AB × (PQ + RS) = ½ × 10 × (12 + 4√14) = 5(12 + 4√14) = 20(3 + √14).

Q65. The ratio of students in the morning shift and afternoon shift of a school was 13 : 9. After 21 students moved from morning to afternoon, this ratio became 19 : 14. Next, some new students joined both shifts in the ratio 3 : 8, and then the ratio became 5 : 4. The number of new students who joined is:

A) 110

B) 88

C) 121

D) 99

Answer: D 99

Solution:

Let initial morning = 13k, afternoon = 9k. After transfer: (13k − 21)/(9k + 21) = 19/14. 14(13k − 21) = 19(9k + 21) → 182k − 294 = 171k + 399 → 11k = 693 → k = 63.

Morning = 819 − 21 = 798, Afternoon = 567 + 21 = 588.

New students: 3t join morning, 8t join afternoon. (798 + 3t)/(588 + 8t) = 5/4. 4(798 + 3t) = 5(588 + 8t) → 3192 + 12t = 2940 + 40t → 28t = 252 → t = 9.

Total new students = 11t = 99.

Q66. If the length of a side of a rhombus is 36 cm and the area of the rhombus is 396 sq. cm, then the absolute value of the difference between the lengths, in cm, of the diagonals of the rhombus is:

Answer: 60

Solution:

Let the diagonals be d_1 and d_2. Area = $d_1*d_2/2 = 396 \rightarrow d_1*d_2 = 792$.

The diagonals bisect each other at right angles, so $(d_1/2)^2 + (d_2/2)^2 = 36^2$. $d_1^2 + d_2^2 = 4 \times 1296 = 5184$. $(d_1 - d_2)^2 = d_1^2 + d_2^2 - 2d_1d_2 = 5184 - 2\times792 = 5184 - 1584 = 3600$. $|d_1 - d_2| = \sqrt{3600} = 60$ cm.

Q67. The number of non-negative integer values of k for which the quadratic equation $x^2 - 5x + k = 0$ has only integer roots, is

Answer: 3

Solution:

For integer roots, the discriminant must be a perfect square: $\Delta = 25 - 4k$ must be a non-negative perfect square. Also $k \geq 0$. So $25 - 4k \geq 0 \rightarrow k \leq 6.25 \rightarrow k \in \{0, 1, 2, 3, 4, 5, 6\}$.

Checking which give a perfect-square discriminant: $k = 0$: $\Delta = 25 = 5^2$ ✓ $k = 4$: $\Delta = 9 = 3^2$ ✓ $k = 6$: $\Delta = 1 = 1^2$ ✓ Others ($k = 1, 2, 3, 5$): $\Delta = 21, 17, 13, 5$ none are perfect squares.

There are 3 valid values of k.

Q68. A shopkeeper offers a discount of 22% on the marked price of each chair, and gives 13 chairs for the discounted price of 12 chairs to earn a profit of 26% on the transaction. If the cost price of each chair is ₹100, then the marked price, in rupees, of each chair is:

Answer: 175

Solution:

Total cost of 13 chairs = 13 × 100 = ₹1300. Required revenue (26% profit) = 1.26 × 1300 = ₹1638.

This amount equals the discounted price of 12 chairs. Discounted price per chair = 1638/12 = ₹136.5.

Discount = 22%, so discounted price = 0.78 × MP. 0.78 × MP = 136.5 → MP = 136.5/0.78 = ₹175.