CAT 2024 Slot 1

Question Paper with Solutions

SECTION I – VERBAL ABILITY & READING COMPREHENSION (VARC)

Instructions for Questions 1–4: Read the passage and answer the questions that follow.

[T]he idea of craftsmanship is not simply nostalgic. Crafts require distinct skills, an all-round approach to work that involves the whole product rather than individual parts, and an attitude that necessitates devotion to the job and a focus on the communal interest. The concept of craft emphasises the human touch and individual judgment.

Essentially, the crafts concept seems to run against the preponderant ethos of management studies which, as academics note, have long prioritised efficiency and consistency. Craft skills were portrayed as primitive and traditionalist.

The contrast between artisanship and efficiency first came to the fore in the 19th century when British manufacturers suddenly faced competition from across the Atlantic as firms developed the 'American system' using standardised parts. The worldwide success of the Singer sewing machine showed the potential of mass-produced devices. This process created its own reaction, first in the form of the Arts and Crafts movement of the late 19th century, and then again in the 'small is beautiful' movement of the 1970s. A third crafts movement is emerging as people become aware of the environmental impact of conventional industry.

There are two potential markets for those who practise crafts. The first stems from consumers willing to pay a premium for goods deemed to be of extra quality. The second lies in those consumers who wish to use their purchases to support local workers, or to reduce their environmental impact by taking goods to craftspeople to be mended or recycled.

For workers, the appeal of craftsmanship is that it allows them the autonomy to make creative choices, making a job far more satisfying. In that sense, it could offer hope for the overall labour market. Let machines automate dull and repetitive tasks, and let workers focus on skills, judgment, and imagination. As a current example, academics cite the 'agile' manifesto in software, an industry at the heart of technological change. The pioneers behind the original agile manifesto promised to prioritise 'individuals and interactions over processes and tools'. By bringing together experts from different teams, agile working is designed to improve creativity.

But the broader question is whether crafts can create many more jobs than they do today. Demand for crafted products may rise, but will it be easy to retrain workers from sectors that might get automated (such as truck drivers)? In a world where products and services often have to pass through regulatory hoops, large companies will usually have the advantage.

History also suggests that the link between crafts and creativity is not automatic. Medieval craft guilds were monopolies that resisted new entrants. They were also highly hierarchical, with young men required to spend long periods as apprentices and journeymen before they could set up on their own; by that time the innovative spirit may have been knocked out of them. Craft workers can thrive in the modern era, but only if they don't get too organised.

Q1. We can infer from the passage that medieval craft guilds resembled mass production in that both

A) did not necessarily promote creativity.

B) discouraged innovation by restricting entry through strict rules.
C) did not always employ egalitarian production processes.
D) focused excessively on product quality.

Answer: A

Solution:

Both medieval craft guilds and mass production share a tendency to suppress creativity. The guilds were hierarchical monopolies that resisted new entrants and imposed long apprenticeships that could extinguish the innovative spirit over time. Mass production similarly prioritises efficiency and consistency over creativity.

Option B is inapplicable to mass production, which does not restrict entry through strict rules.

Option C is not discussed.

Option D is not supported for either system.

Q2. Which one of the following statements is NOT inconsistent with the views stated in the passage?

A) We need to support the crafts; only then can we retain the creativity intrinsic to their production.
B) Creativity in the crafts could be stifled if the market for artisan goods becomes too organised.
C) The Arts and Crafts movement was initially inspired by the 'American system' of production.
D) The agile movement in software is a throwback to the tenets of the medieval craft guilds.

Answer: B

Solution:

Option B aligns with the passage's closing warning that craft workers can thrive only if they avoid becoming too organised exactly as the medieval guilds' over-organisation stifled innovation.

Option A overstates the case; the passage does not say supporting crafts is the only way to preserve creative output.

Option C reverses the causal relationship: the Arts and Crafts movement was a reaction against the American system, not inspired by it.

Option D is contradicted directly, since agile working values creativity and collaboration while the medieval guilds were hierarchical and restrictive.

Q3. The author questions the ability of crafts to create substantial employment opportunities presently because

A) the low scale of crafts production will not be able to absorb the mass of redundant labour.
B) regulatory requirements could make it difficult for small crafts outfits to compete.
C) workers made redundant by automation are unlikely to opt for crafts-related work.
D) craft guilds tend to resist new entrants and are unlikely to accept large numbers of trainees.

Answer: B

Solution:

The author explicitly states that in a world where products and services must pass through regulatory hoops, large companies will usually have the advantage implying that small craft businesses struggle to compete in regulated markets.

Option A is not the author's primary concern.

Option C is not stated; the author questions the ease of retraining, not workers' willingness.

Option D refers to historical guilds, not present-day craft operations.

Q4. The most recent revival in interest in the crafts is a result of the emergence of all of the following EXCEPT:

A) support for individual creations as opposed to mass-produced objects.

B) concerns about the environmental impact of mass production.

C) a niche market for discerning buyers of quality products.

D) a greater interest in buying locally produced goods.

Answer: A

Solution:

The passage identifies the newest wave of craft interest as being driven by environmental awareness (B), a premium market for quality goods (C), and support for local workers and recycling (D).

'Support for individual creations as opposed to mass-produced objects' (A) is not specifically cited as a driver of the current, third crafts revival; the focus is on quality, sustainability, and community, not individual expression per se.

Q5. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Scientific research shows that many animals are very intelligent and have sensory and motor abilities that dwarf ours. Dogs are able to detect diseases such as cancer and diabetes and warn humans of impending heart attacks and strokes. Elephants, whales, hippopotamuses, giraffes, and alligators use low-frequency sounds to communicate over long distances, often miles. Many animals also display wide-ranging emotions, including joy, happiness, empathy, compassion, grief, and even resentment and embarrassment. It's not surprising that animals share many emotions with us because we also share brain structures, located in the limbic system, that are the seat of our emotions.

A) The advanced sensory and motor abilities of animals is the reason why they can display wide-ranging emotions.

B) The similarity in brain structure explains why animals show emotions typically associated with humans.

C) Animals can show emotions which are typically associated with humans.

D) Animals are more intelligent than us in sensing danger and detecting diseases.

Answer: B

Solution:

The passage's closing sentence is its key explanatory claim: animals share emotions with us because we share the same limbic brain structures. Option B captures this causal relationship precisely.

Option A incorrectly links sensory abilities to emotions rather than brain structure.

Option C states a fact from the passage but omits the crucial reason given.

Option D misrepresents the passage, which never claims animals are more intelligent overall.

Instructions for Questions 6–9: Read the passage and answer the questions that follow.

Oftentimes, when economists cross borders, they are less interested in learning from others than in invading their garden plots. Gary Becker, for instance, pioneered the idea of human capital. To do so, he famously tackled topics like crime and domesticity, applying methods honed in the study of markets to domains of non-market life. He projected economics outward into new realms: for example, by revealing the extent to which humans calculate marginal utilities when choosing their spouses or stealing from neighbours. At the same time, he did not let other ways of thinking enter his own economic realm: he did not borrow from anthropology or history or let observations of non-market economics inform his homo economicus. Becker was a picture of the imperial economist in the heyday of the discipline's bravura.

Times have changed for the once almighty discipline. Economics has been taken to task, within and beyond its ramparts. Some economists have reached out, imported, borrowed, and collaborated been less imperial, more open. Consider Thomas Piketty and his outreach to historians. The booming field of behavioural economics the fusion of economics and social psychology is another case. Having spawned active subfields, like judgment, decision-making and a turn to experimentation, the field aims to go beyond the caricature of Rational Man to explain how humans make decisions.

It is important to underscore how this flips the way we think about economics. For generations, economists have presumed that people have interests 'preferences,' in the neoclassical argot that get revealed in the course of people's choices. Interests come before actions and determine them. If you are hungry, you buy lunch; if you are cold, you get a sweater. If you only have so much money and can't afford to deal with both your growling stomach and your shivering, which need you choose to meet using your scarce savings reveals your preference.

Psychologists take one look at this simple formulation and shake their heads. Increasingly, even some mainstream economists have to admit that homo economicus doesn't always behave like the textbook maximiser; irrational behaviour can't simply be waved away as extra-economic expressions of passions over interests. This is one place where the humanist can help the economist. If narrative economics is going to help us understand how rivals duke it out, who wins and who loses, we are going to need much more than lessons from epidemiological studies of viruses or intracranial stimuli.

Above all, we need politics and institutions. Shiller connects perceptions of narratives to changes in behaviour and thence to social outcomes. He completes a circle that was key to behavioural economics and brings in storytelling to make sense of how perceptions get framed. This cycle (perception to behaviour to society) was once mediated or dominated by institutions: the political parties, lobby groups, and media organisations that played a vital role in legitimating, representing, and excluding interests. Yet institutions have been stripped from Shiller's account, to reveal a bare dynamic of emotions and economics, without the intermediating place of politics.

Q6. We can infer from the passage that the term 'homo economicus' refers to someone who

A) is not influenced by the preferences and choices of others.

B) believes in borrowing and collaborating with other disciplines in their work.

C) makes rational decisions based on their own preferences.

D) maximises their opportunities based on non-market choices.

Answer: C

Solution:

The passage presents 'homo economicus' as the textbook model of a rational maximiser whose decisions are governed by internally held preferences. The hunger-versus-cold example illustrates decision-making driven purely by individual preference and rational self-interest.

Option A is too narrow; the model is about rational decision-making, not simply isolation from others. Option B describes the newer, collaborative economists the opposite of homo economicus.

Option D contradicts the concept, which is rooted in market logic.

Q7. 'Times have changed for the once almighty discipline.' We can infer from this statement and the associated paragraph that the author is being

A) sarcastic about how economists, who earlier shunned other disciplines, are now beginning to incorporate them in their analyses.

B) disparaging of economists' inability to precisely predict market behaviour, and their borrowing from other disciplines to remedy this.

C) judgemental about the ability of economic tools to accurately manage crises, leading to the downfall of this lofty science.

D) critical of economists openly borrowing and collaborating across disciplines to explain how humans make decisions.

Answer: A

Solution:

The phrase 'once almighty' carries a mildly ironic tone, noting that an imperious discipline is now opening its doors to others. The author describes how economics has been 'taken to task' and how economists are now 'reaching out, importing, and collaborating.' The sarcasm lies in the contrast: the discipline that once refused to borrow from anyone now must do so.

Options B and C attribute negative motivations (predictive failure, downfall) that are not in the passage.

Option D misreads the passage; the author regards interdisciplinary collaboration positively.

Q8. The author critiques Shiller's approach to behavioural economics for

A) ignoring the marginal role that media and politics play in influencing people's behaviour.

B) denigrating the role of institutions while creating a link between behavioural economics and perceptions.

C) linking emotions and rational behaviour without considering the mediation of social institutions.

D) relying excessively on storytelling as the main influence on the formation of perceptions.

Answer: C

Solution:

The author's critique is explicit: Shiller strips institutions from his account, leaving only 'a bare dynamic of emotions and economics, without the intermediating place of politics.' The passage stresses that the cycle of perception → behaviour → society was historically mediated by political parties, lobby groups, and media factors Shiller ignores.

Option A understates the case; these institutions are not 'marginal' but central.

Option B goes too far, Shiller is not said to denigrate institutions.

Option D is not the primary criticism; storytelling is one of Shiller's tools, not the flaw itself.

Q9. In the first paragraph the author is making the point that economists like Becker

A) benefitted from the application of their principles and concepts to non-economic phenomena.

B) had begun to borrow concepts from other disciplines but were averse to the latter applying economic principles.

C) used economics to analyse non-market behaviour, without incorporating perspectives from other areas of inquiry.

D) tended to guard their discipline from poaching by academics from other subject areas.

Answer: C

Solution:

The first paragraph describes Becker as an 'imperial economist' who projected economic methods outward into non-market domains (crime, domesticity, spouse selection) while simultaneously refusing to let ideas from anthropology, history, or non-market observation enter his own framework. This one-way imperialism is the author's key point.

Option A is not stated.

Option B reverses the dynamic: Becker did not borrow from others; others were not applying economics either.

Option D implies active guarding, whereas the text focuses on Becker's failure to absorb outside perspectives.

Q10. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: Comprehending a wide range of emotions, Renaissance music nevertheless portrayed all emotions in a balanced and moderate fashion.

Paragraph:

A volume of translated Italian madrigals were published in London during the year 1588. This sudden public interest facilitated a surge of English Madrigal writing as well as a spurt of other

secular music writing and publication. ___(1)___. This music boom lasted for thirty years and was as much a golden age of music as British literature was with Shakespeare and Queen Elizabeth I. ___(2)___. The rebirth in both literature and music originated in Italy and migrated to England; the English madrigal became more humorous and lighter in England as compared to Italy. Renaissance music was mostly polyphonic in texture. ___(3)___. Extreme use of and contrasts in dynamics, rhythm, and tone colour do not occur. ___(4)___. The rhythms in Renaissance music tend to have a smooth, soft flow instead of a sharp, well-defined pulse of accents.

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

Answer: B (Option 3)

Solution:

Position 3 is the logical home for this sentence because it bridges the statement that Renaissance music is polyphonic in texture and the claim that extreme contrasts do not occur. The missing sentence affirming balanced, moderate emotional expression explains why extremes are absent.

Positions 1 and 2 are embedded in the historical narrative about the English madrigal tradition, where a comment about emotional balance would be an intrusion.

Position 4, placed after the statement about extremes, would be anticlimactic and redundant.

Q11. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: Understanding central Asia's role helps developments make more sense not only across Asia but in Europe, the Americas and Africa.

Paragraph:

The nations of the Silk Roads are sometimes called 'developing countries', but they are actually some of the world's most highly developed countries, the very crossroads of civilisation, in advanced states of disrepair. ___(1)___. These countries lie at the centre of global affairs: they have since the beginning of history. Running across the spine of Asia, they form a web of connections fanning out in every direction, routes along which pilgrims and warriors, nomads and merchants have travelled, goods and produce have been bought and sold, and ideas exchanged, adapted and refined. ___(2)___.They have carried not only prosperity, but also death and violence, disease and disaster. ___(3)___. The Silk Roads are the world's central nervous system, connecting otherwise far-flung peoples and places…. ___(4)___. It allows us to see patterns and links, causes and effects that remain invisible if one looks only at Europe, or North America.

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

Answer: D (Option 4)

Solution:

The missing sentence shifts the discussion from describing what the Silk Roads are to explaining why understanding Central Asia's role is globally useful a perspective that fits naturally after the 'central nervous system' metaphor in position 4.

The sentence following position 4 ('It allows us to see patterns…') then elaborates on this claim. Position 1 fails because the next sentence refers to 'These countries' (the Silk Road nations just described).

Positions 2 and 3 interrupt the description of what the Silk Roads have carried.

Q12. Five jumbled up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.

1. Urbanites also have more and better options for getting around: Uber is ubiquitous; easy-to-rent dockless bicycles are spreading; battery-powered scooters will be next.
2. When more people use buses or trains the service usually improves because public-transport agencies run more buses and trains.
3. Worsening services on public transport, terrorist attacks in some urban metros and a rise in fares have been blamed for this trend.
4. It seems more likely that public transport is being squeezed structurally as people's need to travel is diminishing as a result of smartphones, videoconferencing, online shopping and so on.
5. There has been a puzzling decline in the use of urban public transport in many countries in the west, despite the growth in urban populations and rising employment.

Answer: 2

Solution:

Sentences 5 → 3 → 4 → 1 build a coherent paragraph: sentence 5 introduces the paradoxical decline of urban public transport; sentence 3 lists commonly cited reasons;

Sentence 4 offers a deeper structural explanation (technology reducing the need to travel);

Sentence 1 supports this by listing alternative mobility options now available in cities.

Sentence 2, which argues that ridership increases improve services, directly contradicts the theme of decline and does not connect logically to any of the other four sentences.

Instructions for Questions 13–16: Read the passage and answer the questions that follow.

Landing in Australia, the British colonists weren't much impressed with the small-bodied, slender-snouted marsupials called bandicoots. 'Their muzzle, which is much too long, gives them an air exceedingly stupid,' one naturalist noted in 1805. They nicknamed one type the 'zebra rat' because of its black-striped rump.

Silly-looking or not, though, the zebra rather smallest bandicoot, more commonly known today as the western barred bandicoot exhibited a genius for survival in the harsh outback, where its ancestors had persisted for some 26 million years. Its births were triggered by rainfall in the bone-dry desert. It carried its breath-mint-size babies in a backward-facing pouch so mothers could forage for food and dig shallow, camouflaged shelters.

Still, these adaptations did not prepare the western barred bandicoot for the colonial-era transformation of its ecosystem, particularly the onslaught of imported British animals, from cattle and rabbits that damaged delicate desert vegetation to ravenous house cats that soon developed a taste for bandicoots. Several of the dozen-odd bandicoot species went extinct, and by the 1940s the

western barred bandicoot, whose original range stretched across much of the continent, persisted only on two predator-free islands in Shark Bay, off Australia's western coast.

'Our isolated fauna had simply not been exposed to these predators,' says Reece Pedler, an ecologist with the Wild Deserts conservation program.

Now Wild Deserts is using descendants of those few thousand island survivors, called Shark Bay bandicoots, in a new effort to seed a mainland bandicoot revival. They've imported 20 bandicoots to a preserve on the edge of the Strzelecki Desert, in the remote interior of New South Wales. This sanctuary is a challenging place, desolate much of the year, with one of the world's most mercurial rainfall patterns relentless droughts followed by sudden drenching floods.

The imported bandicoots occupy two fenced 'exclosures,' cleared of invasive rabbits (courtesy of Pedler's sheepdog) and of feral cats (which slunk off once the rabbits disappeared). A third fenced area contains the program's Wild Training Zone, where two other rare marsupials (bilbies, a larger type of bandicoot, and mulgaras, a somewhat fearsome fuzzball known for sucking the brains out of prey) currently share terrain with controlled numbers of cats, learning to evade them.

For now, though, a recent surge of rainfall has led to a bandicoot joey boom, raising the Wild Deserts population to about 100, with other sanctuaries adding to that number. There are also signs of rebirth in the landscape itself. With their constant digging, the bandicoots trap moisture and allow for seed germination so the cattle-damaged desert can restore itself. They have a new nickname flattering one, this time. 'We call them ecosystem engineers,' Pedler says.

Q13. According to the text, the western barred bandicoots now have a flattering name because they have

A) aided in altering an arid environment.
B) led a revival in preserving the species.
C) grown fivefold in terms of population.
D) led to a surge and increase of rainfall.

Answer: A

Solution:

The bandicoots earned the nickname 'ecosystem engineers' specifically because their constant digging traps moisture and promotes seed germination, thereby helping restore the cattle-damaged desert landscape. This directly corresponds to 'altering an arid environment.'

Option B conflates conservation efforts (run by humans) with the bandicoots' own ecological contribution.

Option C misreads the text: the population grew because of rainfall, not the other way round.

Option D inverts causality; rainfall triggered the boom, not the bandicoots.

Q14. Which one of the following options does NOT represent the characteristics of the western barred bandicoot?

A) Shallow diggers having an elongated muzzle.

B) Smallest black-striped marsupial that uses camouflage and digs.

C) Look of a rat but with a baby pouch and a slender snout.

D) Long thin nose, black-striped back, pouch for joeys.

Answer: B

Solution:

The passage says the bandicoot's shelters are camouflaged, not the animal itself there is no mention of the animal using personal camouflage as a defence strategy.

Options A, C, and D all correctly reflect features described in the text: the slender/elongated muzzle, the digging behaviour, the small body resembling a rat, the backward-facing joey pouch, and the black-striped rump.

Q15. The text uses the word 'exclosures' because Wild Deserts has adopted a measure of

A) restoring cattle-damaged deserts to green landscapes.

B) ridding the main desert of feral cats and large bilbies.

C) excluding animals to make the islands predator-free.

D) barring the entry of invasive species.

Answer: D

Solution:

An 'exclosure' is a fenced area that keeps specified animals out the opposite of an enclosure. The two exclosures in the passage were cleared of invasive rabbits and feral cats, allowing bandicoots to live there safely.

Option D captures this accurately.

Option A relates to the bandicoots' ecological impact, not the exclosure concept.

Option B is partially correct but bilbies are described as inhabitants of the training zone, not animals being expelled.

Option C describes the Shark Bay islands, not the mainland exclosures.

Q16. Which one of the following statements provides a gist of this passage?

A) The onslaught of animals such as cattle, rabbits and housecats brought in by the British led to the extinction of the western barred bandicoot.

B) The negligent attitude of the British colonists towards these bandicoots, evidenced by the names given to them, led to their annihilation.

C) Marsupials are going extinct due to the colonial-era transformation of the ecosystem, which also destroyed natural vegetation.

D) A type of bandicoot was nearly wiped out by invasive species, but rescuers now pin hopes on a remnant island population.

Answer: D

Solution:

Option D covers both narrative arcs: the near-extinction caused by invasive colonial-era species and the ongoing conservation effort using Shark Bay island survivors.

Option A incorrectly states the bandicoots went extinct; they survived on islands.

Option B exaggerates the role of colonial attitudes; the near-extinction was caused by ecological disruption, not name-calling.

Option C broadens the claim to all marsupials, whereas the passage focuses specifically on one bandicoot species.

Q17. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

> Cartographers design and create maps to communicate information about phenomena located somewhere on our planet. In the past, cartographers did not worry too much about who was going to read their maps. Although some simple 'usability' research was done, like comparing whether circle or bar symbols worked best cartographers knew how to make maps. This has changed now, however, due to all kinds of societal and technological developments. Today, map readers are more demanding mostly because of the tools they use to read maps. Cartographers, who are also influenced by these trends, are now more interested in seeing if their products are efficient, effective, and appreciated.

A) Today, cartographers also need to look into the usability of maps because of new technological developments.

B) Modern mapmakers evaluate a map's effectiveness, efficiency and user satisfaction through a series of experiments.

C) Maps are being used for a variety of reasons and therefore map readers have become more demanding.

D) New technological developments have prompted cartographers to experiment with their maps by applying these new innovations.

Answer: A

Solution:

The passage's central argument is that societal and technological changes have made map readers more demanding, prompting cartographers to shift their focus towards ensuring their maps are efficient, effective, and well-received.

Option A accurately captures this cause-and-effect relationship. Option B incorrectly implies specific experimental methods are used.

Option C misidentifies the cause as varied map uses rather than technological change.

Option D incorrectly suggests cartographers are experimenting with new technologies, whereas the passage focuses on evaluating usability.

Q18. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: The brain isn't organised the way you might set up your home office or bathroom medicine cabinet.

Paragraph:

___(1)___. You can't just put things anywhere you want to. The evolved architecture of the brain is haphazard and disjointed, and incorporates multiple systems, each of which has a mind of its own. ___(2)___. Evolution doesn't design things and it doesn't build systems it settles on systems that, historically, conveyed a survival benefit. There is no overarching, grand planner engineering the systems so that they work harmoniously together. ___(3)___. The brain is more like a big, old house with piecemeal renovations done on every floor, and less like new construction. ___(4)___.

A) Option 4

B) Option 1

C) Option 2

D) Option 3

Answer: B (Option 1)

Solution:

The missing sentence is an apt opening comparison that introduces the passage's central idea by contrasting the brain's architecture with familiar organised spaces (a home office, a medicine cabinet). Placed at position 1, it launches the paragraph naturally, and the next sentence ('You can't just put things anywhere you want to') immediately builds on it.

At position 2 or 3 it would interrupt the discussion of evolution and systems. At position 4 it would come after the 'old house' metaphor already makes a very similar point, creating redundancy.

Q19. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Certain codes may, of course, be so widely distributed in a specific language community or culture, and be learned at so early an age, that they appear not to be constructed the effect of an articulation between sign and referent but to be 'naturally' given. Simple visual signs appear to have achieved a 'near-universality' in this sense: though evidence remains that even apparently 'natural' visual codes are culture-specific. However, this does not mean that no codes have intervened; rather, that the codes have been profoundly naturalised. The operation of naturalised codes reveals not the transparency and 'naturalness' of language but the depth, the habituation and the near-universality of the codes in use. They produce apparently 'natural' recognitions. This has the (ideological) effect of concealing the practices of coding which are present.

A) Learning linguistic and visual signs at an early age makes all such codes appear natural. This naturalisation of codes is the effect of ideology.

B) Not all codes are natural but certain codes are naturalised and made to appear universal. Ideology aims to hide the mechanism of coding behind signs.

C) Language and visual signs are codes. However, some of the codes are so widespread that they not only seem naturally given but also hide the mechanism of coding behind the signs.

D) All codes, linguistic and visual, have a natural origin but some are so widespread that they become universal. This is what hides the mechanism of coding behind signs.

Answer: C

Solution:

Option C best captures the passage's argument: certain codes, through widespread use, come to seem naturally given when they are actually constructed, and in doing so they conceal their own coding mechanism.

Option A misstates the reason early learning is mentioned, but it is not the cause of apparent naturalness; widespread distribution and habituation are.

Option B inaccurately implies ideology deliberately works to conceal coding, whereas the passage says the concealment is an effect.

Option D is incorrect because the passage explicitly states no codes have a natural origin only a naturalised appearance.

Q20. Five jumbled up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.

1. Animals have an interest in fulfilling their basic needs, but also in avoiding suffering, and thus we ought to extend moral consideration.
2. Singer viewed himself as a utilitarian, and presents a direct moral theory concerning animal rights, in contrast to indirect positions, such as welfarist views.
3. He argued for extending moral consideration to animals because, similar to humans, animals have certain significant interests.
4. The event that publicly announced animal rights as a legitimate issue within contemporary philosophy was Peter Singer's Animal Liberation text in 1975.
5. As such, we ought to view their interests alongside and equal to human interests, which results in humans having direct moral duties towards animals.

Answer: 1

Solution:

The coherent sequence is 4 → 2 → 3 → 5.

Sentence 4 introduces Singer's text as the landmark event. Sentence 2 places his utilitarian standpoint in context.

Sentence 3 gives his core argument for moral consideration of animals.

Sentence 5 draws the conclusion about equal treatment and direct moral duties.

Sentence 1 is the odd one out: rather than developing Singer's specific argument, it makes a general philosophical claim about animal interests and suffering that does not connect logically to the thread of Singer's theory being built by the other four sentences.

Instructions for Questions 21–24: Read the passage and answer the questions that follow.

In the summer of 2022, subscribers to the US streaming service HBO MAX were alarmed to discover that dozens of the platform's offerings from the Covid-themed heist thriller Locked Down to the recent remake of The Witches had been quietly removed from the service. The news seemed like

vindication to those who had long warned that streaming was more about controlling access to the cultural commons than expanding it, as did reports (since denied by the show's creators) that Netflix had begun editing old episodes of Stranger Things to retroactively improve their visual effects.

What's less clear is whether the commonly prescribed cure for these cultural ills' return to the material pleasures of physical medias the right one. While the makers of Blu-ray discs claim they have a shelf life of 100 years, such statistics remain largely theoretical until they come to pass, and are dependent on storage conditions, not to mention the continued availability of playback equipment. The humble DVD has already proved far less resilient, with many early releases already beginning to deteriorate in quality. Digital movie purchases provide even less security. Any film 'bought' on iTunes could disappear if you move to another territory with a different rights agreement and try to redownload it. It's a bold new frontier in the commodification of art: the birth of the product recall. After a man took to Twitter to bemoan losing access to Cars 2 after moving from Canada to Australia, Apple clarified that users who downloaded films to their devices would retain permanent access to those downloads, even if they relocated to a hemisphere where the content was subject to a different set of rights agreements. Thanks to the company's ironclad digital rights management technology, however, such files cannot be moved or backed up, locking you into watching with your Apple account.

Anyone who does manage to acquire Digital Rights Management free (DRM-free) copies of their favourite films must nonetheless grapple with ever-changing file format standards, not to mention data decay the gradual process by which electronic information slowly but surely corrupts. Only the regular migration of files from hard drive to hard drive can delay the inevitable, in a Sisyphean battle against the ravages of digital time.

In a sense, none of this is new. Charlie Chaplin burned the negative of his 1926 film A Woman of the Sea as a tax write-off. Many more films have been lost through accident, negligence or plain indifference. During a heatwave in July 1937, a Fox film vault in New Jersey burned down, destroying a majority of the silent films produced by the studio.

Back then, at least, cinema was defined by its ephemerality: the sense that a film was as good as gone once it left your local cinema. Today, with film studios keen to stress the breadth of their back catalogues (or, to put it in Hollywood terms, the value of their IPs), audiences may start to wonder why those same studios seem happy to set the vault alight themselves if it'll help next quarter's numbers.

Q21. Which one of the following statements about art best captures the arguments made in the passage?

A) In the age of online subscription services, it is time to change our understanding of classic works of art being primarily immutable and easily available to the public.

B) As art is increasingly created, stored and distributed digitally, access to it is counterintuitively likely to be made more difficult by the rapid churn in technology and the whims of host platforms.

C) Accepting retroactive changes to works of art is dangerous because it will encourage creators to not put enough effort into the original attempt, given that they can always edit or update their work later.

D) Works of art belong to the cultural commons and hence must remain available in perpetuity, irrespective of who pays for access to them.

Answer: B

Solution:

The passage demonstrates through multiple examples content removal by HBO MAX, geo-blocking on iTunes, data decay, and DRM restrictions that digital distribution does not guarantee easier access to films; on the contrary, access becomes fragile and contingent in new ways.

Option B captures this counterintuitive argument precisely.

Option A inverts the passage's thrust; it argues access is becoming harder, not that our understanding needs changing.

Option C is an overstatement of a minor example.

Option D articulates an ideological position that the passage raises implicitly but does not itself argue.

Q22. Which one of the following statements, if true, would best invalidate the main argument of the passage?

A) Recent research has irrefutably proven that Blu-ray discs have a shelf life of at least 100 years.

B) Studios and streaming services have committed to giving customers perpetual and platform-independent access to the original digital content they have paid for.

C) When moving to a different geographical location, customers can easily use Virtual Private Networks (VPNs) to bypass geo-blocking and regain access to their content on any streaming service.

D) Improved cloud storage services have made it possible for movie collections to now be preserved in perpetuity, without the need to keep migrating the files.

Answer: B

Solution:

The passage's main argument is that digital ownership is precarious because platforms can remove content, rights vary by geography, and files deteriorate.

Option B directly addresses and refutes this by committing studios and services to permanent, platform-independent access which would eliminate the core problem.

Option A validates Blu-ray but does not address digital access, streaming removals, or rights agreements.

Option C offers a workaround for geo-blocking but does not resolve the broader issues of content removal or data decay.

Option D addresses storage but not the access and rights problems central to the argument.

Q23. Which of the following statements is suggested by the sentence 'Back then, at least, cinema was defined by its ephemerality: the sense that a film was as good as gone once it left your local cinema'?

A) Around a century ago, people were more accepting of not having access to films once they left the local cinema.

B) Today, films are expected to be available for a long time, since they are no longer tied solely to their stay at the local cinema.

C) Cinema is now no longer as ephemeral as it used to be earlier, because the technology used for creating and preserving films has improved manifold.

D) Presently, there is no reason why film studios should remove access to films once they have left the local cinema.

Answer: B

Solution:

The sentence contrasts the past when films vanished after their theatrical run and audiences accepted that with the present, where studios tout the value of their back catalogues and audiences therefore expect ongoing access.

Option B captures this contrast.

Option A is a possible inference about past acceptance but focuses on the past rather than the present implication.

Option C credits technology, which is not what the sentence suggests.

Option D draws a prescriptive conclusion about studios' obligations that is not directly implied by the historical comparison.

Q24. 'Netflix had begun editing old episodes of Stranger Things to retroactively improve their visual effects.' What is the purpose of this example used in the passage?

A) To show that streaming services are controlling access to the cultural commons rather than expanding it.

B) To show how unsubstantiated reports are leading to an increase in the level of distrust towards streaming services.

C) To show a practice that justifies the fears of people who feel streaming services cannot be trusted to be custodians of cultural artefacts like film.

D) To show that art in the digital age, specifically film, is no longer sacrosanct, and may be changed to suit changing tastes or technology.

Answer: C

Solution:

The Stranger Things example is cited alongside content removal from HBO MAX as evidence that streaming platforms may tamper with or delete cultural artefacts reinforcing the view that these platforms cannot be relied upon as guardians of film as a cultural heritage.

Option A is the broader theme the passage illustrates but does not specifically address the editing aspect.

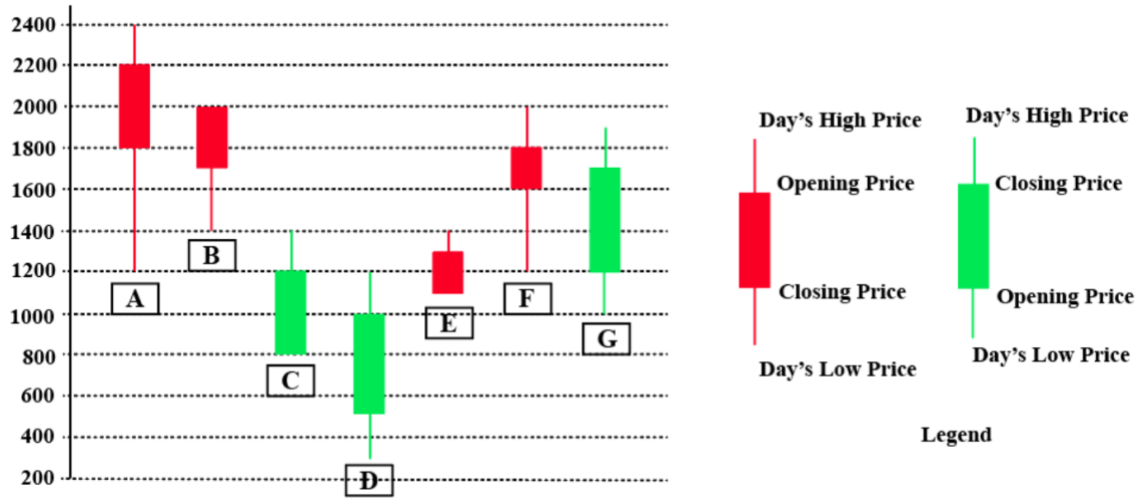
Option B focuses on the unverified nature of the report, which is secondary to its illustrative purpose.

Option D correctly identifies the implication of alteration but misses the specific argument about trust in streaming services as custodians.

SECTION II – DATA INTERPRETATION & LOGICAL REASONING (DILR)

Instructions for Questions 25–28:

The chart below shows the price data for seven shares - A, B, C, D, E, F, and G as a candlestick plot for a particular day. The vertical axis shows the price of the share in rupees. A share whose closing price (price at the end of the day) is more than its opening price (price at the start of the day) is called a bullish share; otherwise, it is called a bearish share. All bullish and bearish shares are shown in green and red colour respectively.



Q25. Daily Share Price Variability (SPV) is defined as (Day's high price − Day's low price) ÷ (Average of the opening and closing prices during the day). Which among the shares A, C, D and F had the highest SPV on that day?

A) F
B) A
C) D
D) C

Answer: C (D)

Solution:

Computing SPV for each candidate:

- F: (2000 − 1200) ÷ [(1800 + 1600)/2] = 800 ÷ 1700 ≈ 0.471
- A: (2400 − 1200) ÷ [(2200 + 1800)/2] = 1200 ÷ 2000 = 0.600
- D: (1200 − 300) ÷ [(500 + 1000)/2] = 900 ÷ 750 = 1.200
- C: (1400 − 800) ÷ [(800 + 1200)/2] = 600 ÷ 1000 = 0.600

Share D has the highest SPV of 1.200, well above all others.

Q26. Daily Share Price Variability (SPV) is defined as (Day's high price − Day's low price) ÷ (Average of the opening and closing prices during the day). How many shares had an SPV greater than 0.5 on that day?

Answer: 4

Solution:

Computing SPV for all seven shares:

- A: 1200 ÷ 2000 = 0.600
- B: 600 ÷ 1850 ≈ 0.324
- C: 600 ÷ 1000 = 0.600
- D: 900 ÷ 750 = 1.200
- E: 300 ÷ 1200 = 0.250
- F: 800 ÷ 1700 ≈ 0.471
- G: 900 ÷ 1450 ≈ 0.621

Shares A, C, D and G exceed 0.5. The answer is 4.

Q27. Daily loss for a share is defined as (Opening price − Closing price) ÷ (Opening price). Which among the shares A, B, F and G had the highest daily loss on that day?

A) G
B) B
C) A
D) F

Answer: C (A)

Solution:

Only bearish shares (opening > closing) can have a positive daily loss. G is bullish, so its daily loss is negative and can be ignored.

- A: (2200 − 1800) ÷ 2200 = 400 ÷ 2200 ≈ 0.182
- B: (2000 − 1700) ÷ 2000 = 300 ÷ 2000 = 0.150
- F: (1800 − 1600) ÷ 1800 = 200 ÷ 1800 ≈ 0.111

Share A has the highest daily loss at approximately 18.2%.

Q28. What would have been the percentage wealth gain for a trader who bought equal numbers of all bullish shares at opening price and sold them at their day's high?

A) 80%
B) 50%
C) 72%
D) 100%

Answer: A (80%)

Solution:

Bullish shares are C, D, and G. Assuming the trader buys 1 unit of each:

- C: Bought at 800, sold at 1400 → gain 600
- D: Bought at 500, sold at 1200 → gain 700
- G: Bought at 1200, sold at 1900 → gain 700

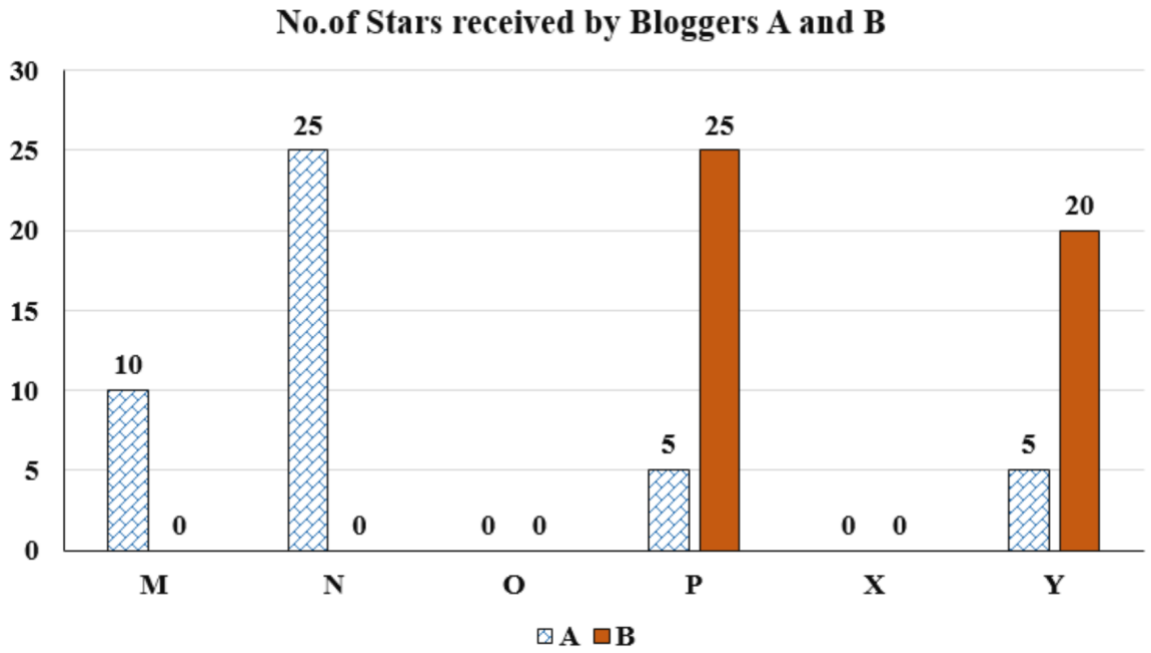
Total investment: 800 + 500 + 1200 = 2500

Total proceeds: 1400 + 1200 + 1900 = 4500

Percentage gain: (4500 − 2500) ÷ 2500 × 100 = 80%

Instructions for Questions 29–32:

Six web surfers M, N, O, P , X, and Y each had 30 stars which they distributed among four bloggers A, B, C, and D. The number of stars received by A and B from the six web surfers is shown in the figure below.



The following additional facts are known regarding the number of stars received by the bloggers from the surfers.

1. The numbers of stars received by the bloggers from the surfers were all multiples of 5 (including 0).
2. The total numbers of stars received by the bloggers were the same.
3. Each blogger received a different number of stars from M.
4. Two surfers gave all their stars to a single blogger.
5. D received more stars than C from Y.

Q29. What was the total number of stars received by D?

Answer: 45

Solution:

Since the total stars distributed by all six surfers combined is 6 × 30 = 180, and the problem states all four bloggers received equal totals, each blogger received 180 ÷ 4 = 45 stars.

Therefore D received 45 stars.

Q30. What was the number of stars received by D from Y?

A) 5
B) 10
C) Can't be determined
D) 0

Answer: A (5)

Solution:

Y has already allocated 5 to A and 20 to B (total 25). The remaining 5 stars must be split between C and D. Since D must receive more from Y than C does (Fact 5), and both must be multiples of 5, the only possibility is C = 0 and D = 5.

Hence D received exactly 5 stars from Y.

Q31. How many surfers distributed their stars among exactly 2 bloggers?

Answer: 2

Solution:

Reviewing each surfer: M spread stars across A, C, and D (3 bloggers). N gave 25 to A and 5 to D (2 bloggers). O gave all 30 to one blogger (1 blogger). P gave 5 to A and 25 to B (2 bloggers). X gave all 30 to one blogger (1 blogger). Y gave stars to A, B, and D (3 bloggers). Surfers who distributed among exactly 2 bloggers: N and P. The answer is 2.

Q32. Which of the following can be determined with certainty? I. The number of stars received by C from M II. The number of stars received by D from O

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

Answer: B (Only I)

Solution:

From the working above, M's allocation (10 to A, 0 to B, 15 to C, 5 to D) is uniquely determined by the constraint that all four values are distinct multiples of 5 summing to 30.

Therefore statement I can be determined: C received 15 from M. For statement II, both Case 1 (O gives 30 to C, 0 to D) and Case 2 (O gives 0 to C, 30 to D) satisfy all stated conditions, so D's receipt from O is ambiguous.

Only statement I can be determined with certainty.

Instructions for Questions 33–37:

The game of QUIET is played between two teams. Six teams, numbered 1, 2, 3, 4, 5, and 6, play in a QUIET tournament. These teams are divided equally into two groups. In the tournament, each team plays every other team in the same group only once, and each team in the other group exactly twice. The tournament has several rounds, each of which consists of a few games. Every team plays exactly one game in each round.

The following additional facts are known about the schedule of games in the tournament.

1. Each team played against a team from the other group in Round 8.
2. In Round 4 and Round 7, the match-ups, that is the pair of teams playing against each other, were identical. In Round 5 and Round 8, the match-ups were

1. identical.
2. Team 4 played Team 6 in both Round 1 and Round 2.
3. Team 1 played Team 5 ONLY once and that was in Round 2.
4. Team 3 played Team 4 in Round 3. Team 1 played Team 6 in Round 6.
5. In Round 8, Team 3 played Team 6, while Team 2 played Team 5.

Q33. How many rounds were there in the tournament?

Answer: 8

Solution:

Total games = 6 (within-group) + 18 (cross-group) = 24.

Since every team plays exactly one game per round and there are 6 teams, each round comprises 3 games.

Number of rounds = 24 ÷ 3 = 8.

Q34. What is the number of the team that played Team 1 in Round 5?

Answer: 4

Solution:

Round 5 has the same match-ups as Round 8 (given).

In Round 8: Team 3 v Team 6, Team 2 v Team 5, and Team 1 v Team 4.

Therefore in Round 5, Team 1 played Team 4.

Q35. Which team among the teams numbered 2, 3, 4, and 5 was NOT part of the same group?

A) 5
B) 3
C) 4
D) 2

Answer: A (5)

Solution:

From the group deduction: Group 1 = {1, 5, 6} and Group 2 = {2, 3, 4}.

Teams 2, 3, and 4 all belong to Group 2.

Team 5 belongs to Group 1.

Hence Team 5 is not part of the same group as Teams 2, 3, and 4.

Q36. What is the number of the team that played Team 1 in Round 7?

Answer: 3

Solution:

Rounds 4 and 7 have identical match-ups.

In the schedule, Round 4 contains: Team 2 v Team 6, Team 1 v Team 3, and Team 4 v Team 5.

Therefore in Round 7, Team 1 also played Team 3.

Q37. What is the number of the team that played Team 6 in Round 3?

Answer: 5

Solution:

In Round 3, Team 3 plays Team 4 (given).

The two remaining teams (from the six) that have not yet been paired in Round 3 must play each other.

The remaining teams from Group 1 are 5 and 6, and from Group 2 Team 4 is already occupied, leaving 2 and the cross-group constraint to fill the third slot.

Checking the full schedule, Round 3 comprises: 3 v 4, 5 v 6, 1 v 2. Therefore Team 6 played Team 5 in Round 3.

Instructions for Questions 38–42:

Two students, Amiya and Ramya are the only candidates in an election for the position of class representative. Students will vote based on the intensity level of Amiya's and Ramya's campaigns and the type of campaigns they run. Each campaign is said to have a level of 1 if it is a staid campaign and a level of 2 if it is a vigorous campaign. Campaigns can be of two types, they can either focus on issues, or on attacking the other candidate.

If Amiya and Ramya both run campaigns focusing on issues, then

• The percentage of students voting in the election will be 20 times the sum of the levels of campaigning of the two students. For example, if Amiya and Ramya both run vigorous campaigns, then 20 × (2+2)%, that is, 80% of the students will vote in the election.

• Among voting students, the percentage of votes for each candidate will be proportional to the levels of their campaigns. For example, if Amiya runs a staid (i.e., level 1) campaign while Ramya runs a vigorous (i.e., level 2) campaign, then Amiya will receive 1/3 of the votes cast, and Ramya will receive the other 2/3.

The above-mentioned percentages change as follows if at least one of them runs a campaign attacking their opponent.

• If Amiya runs a campaign attacking Ramya and Ramya runs a campaign focusing on issues, then 10% of the students who would have otherwise voted for Amiya will vote for Ramya, and another 10% who would have otherwise voted for Amiya, will not vote at all.

• If Ramya runs a campaign attacking Amiya and Amiya runs a campaign focusing on issues, then 20% of the students who would have otherwise voted for Ramya will vote for Amiya, and another 5% who would have otherwise voted for Ramya, will not vote at all.

• If both run campaigns attacking each other, then 10% of the students who would have otherwise voted for them had they run campaigns focusing on issues, will not vote at all.

Q38. If both of them run staid campaigns attacking the other, then what percentage of students will vote in the election?

A) 40%
B) 64%
C) 60%
D) 36%

Answer: D (36%)

Solution:

With both running staid (level 1) issue-based campaigns, turnout would be 20 × (1+1) = 40%, split 20%–20%.

Since both campaigns are attacking, Rule (iii) applies: each candidate loses 10% of their own 20%, i.e. 2% each abstain.

Total abstaining = 4%. Actual voters = 40% − 4% = 36%.

Q39. What is the minimum percentage of students who will vote in the election?

A) 32%
B) 40%
C) 38%
D) 36%

Answer: D (36%)

Solution:

To minimise voter turnout, both candidates should run at the lowest level (staid, level 1) and both should attack (which causes the maximum proportion of would-be voters to abstain under the mutual-attack rule).

This is the scenario from Q38, giving 36% turnout.

Any other combination of levels or campaign types yields a higher turnout. Hence 36% is the minimum.

Q40. If Amiya runs a campaign focusing on issues, then what is the maximum percentage of votes that she can get?

A) 48%
B) 44%
C) 40%
D) 36%

Answer: A (48%)

Solution:

To maximise Amiya's votes when she is on issues, choose: Amiya vigorous (level 2) on issues, Ramya vigorous (level 2) attacking.

Turnout = 20 × (2+2) = 80%. Issues split: Amiya 2/(2+2) × 80 = 40%, Ramya 40%.

Ramya attacks, so Rule (ii): 20% of Ramya's 40% (= 8%) switches to Amiya; 5% of Ramya's 40% (= 2%) abstains.

Amiya: 40 + 8 = 48%. Ramya: 40 − 8 − 2 = 30%.

Total voting: 78%. Amiya gets 48% of all students.

Q41. If Ramya runs a campaign attacking Amiya, then what is the minimum percentage of votes that she is guaranteed to get?

A) 12%
B) 15%
C) 30%
D) 18%

Answer: B (15%)

Solution:

To minimise Ramya's vote share when she attacks: choose Ramya staid (level 1) attacking, Amiya vigorous (level 2) on issues.

Turnout = 80%. Issue-based split: Ramya 1/(1+2) × 80 ≈ 26.67%, Amiya ≈ 53.33%. Rule (ii): 20% of Ramya's 26.67% (≈ 5.33%) switches to Amiya; 5% of Ramya's 26.67% (≈ 1.33%) abstains.

Ramya keeps 75% of 26.67% = 20% of all students.

To get the minimum over all scenarios with Ramya attacking, the minimum occurs when Ramya is staid and Amiya is staid on issues (turnout 40%, Ramya 20%, loses 25% → keeps 75% of 20% = 15%). So the minimum is 15%.

Q42. What is the maximum possible voting margin with which one of the candidates can win?

A) 20%
B) 29%

C) 28%

D) 26%

Answer: B (29%)

Solution:

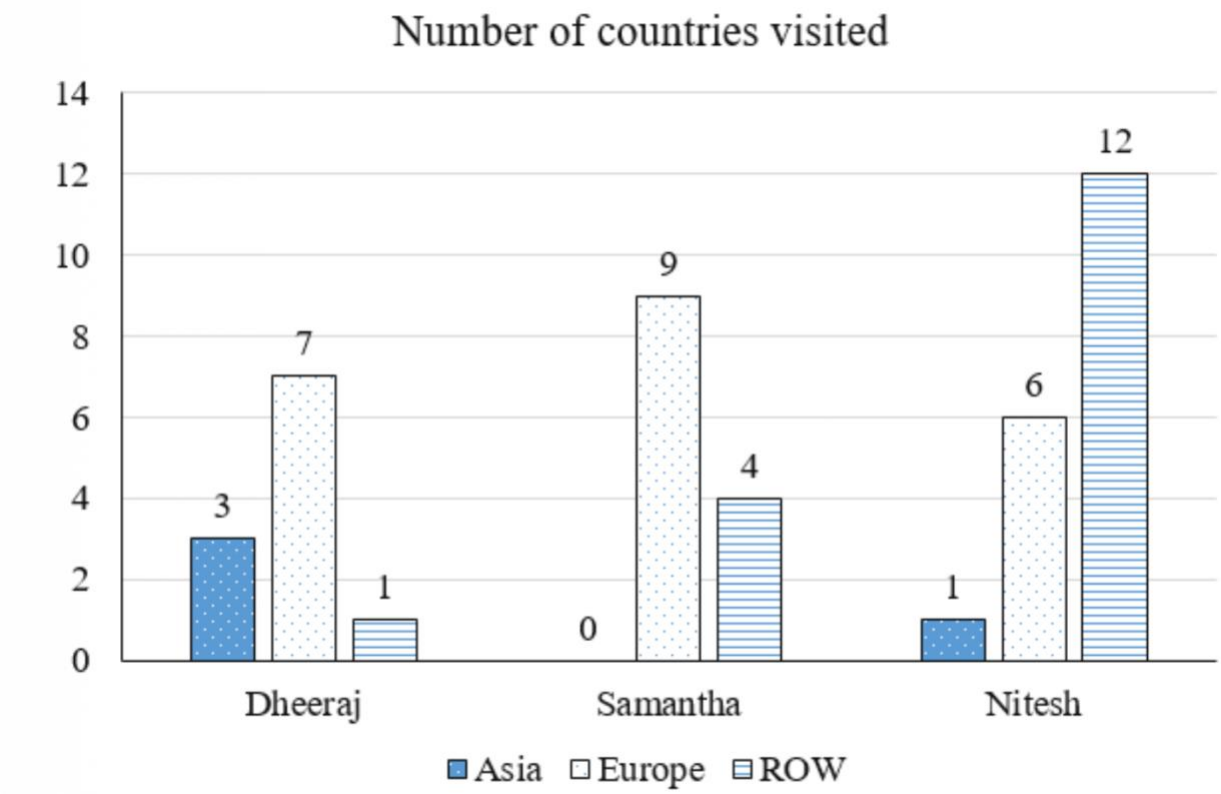
Maximise the winner's margin by maximising the gap between the two candidates.

Using the scenario from Q40 (Ramya staid attacking, Amiya vigorous on issues): Amiya = 44%, Ramya = 15%. Margin = 44 − 15 = 29 percentage points.

Checking other combinations confirms no higher margin is achievable. The maximum possible victory margin is 29%.

Instructions for Questions 43–46:

The chart below provides complete information about the number of countries visited by Dheeraj, Samantha and Nitesh, in Asia, Europe and the rest of the world (ROW).



The following additional facts are known about the countries visited by them.

- 32 countries were visited by at least one of them.
- USA (in ROW) is the only country that was visited by all three of them.
- China (in Asia) is the only country that was visited by both Dheeraj and Nitesh, but not by Samantha.
- France (in Europe) is the only country outside Asia, which was visited by both Dheeraj and Samantha, but not by Nitesh.

- Half of the countries visited by both Samantha and Nitesh are in Europe.

Q43. How many countries in Asia were visited by at least one of Dheeraj, Samantha and Nitesh?

Answer: 3

Solution:

Asian countries visited: Dheeraj alone (2) + China (Dheeraj and Nitesh, but not Samantha, 1) = 3 distinct Asian countries.

Samantha visited no Asian country and no Asian country was visited by all three or by Samantha-Nitesh only.

Total distinct Asian countries = 3.

Q44. How many countries in Europe were visited only by Nitesh?

Answer: 2

Solution:

In Europe: France (Dheeraj + Samantha only) accounts for 1 exactly-two-persons European country. The Samantha-Nitesh overlap has 4 European countries.

Dheeraj's 7 European visits = France (1) + Samantha-Nitesh-Dheeraj (0) + Dheeraj only European countries. Samantha's 9 European visits = France (1) + 4 Samantha-Nitesh + Samantha only.

Nitesh's 6 European = 4 Samantha-Nitesh + Nitesh only. Solving: Nitesh only in Europe = 6 − 4 = 2.

Q45. How many countries in the ROW were visited by both Nitesh and Samantha?

Answer: 4

Solution:

Of the 7 Samantha-Nitesh-only countries (no Dheeraj), half (3.5, rounded: 4 in Europe, 3 in ROW) are in Europe and 3 are in ROW.

Adding the one country visited by all three (USA), total ROW countries visited by both Nitesh and Samantha = 3 + 1 = 4.

Q46. How many countries in Europe were visited by exactly one of Dheeraj, Samantha and Nitesh?

A) 10
B) 5
C) 14
D) 12

Answer: D (12)

Solution:

Exactly one person in Europe: Dheeraj only (6) + Samantha only (4) + Nitesh only (2) = 12.

This is verified against total European visits: 6(D-only) + 4(S-only) + 2(N-only) + 1(France: D+S) + 4(S+N) = 17, which matches the grand total of 22 after accounting for each person's count.

SECTION III – QUANTITATIVE APTITUDE (QA)

Q47. Consider two sets A = {2, 3, 5, 7, 11, 13} and B = {1, 8, 27}. Let f be a function from A to B such that for every element b in B there is at least one element a in A with f(a) = b. Then the total number of such onto functions f is

A) 665
B) 667
C) 537
D) 540

Answer: D (540)

Solution:

Total unrestricted functions from A (6 elements) to B (3 elements): $3^6 = 729$.

Subtract functions missing at least one element of B using inclusion-exclusion:

$|\text{missing one element}| = C(3,1) \times 2^6 = 3 \times 64 = 192$

$|\text{missing two elements}| = C(3,2) \times 1^6 = 3 \times 1 = 3$

$|\text{missing all three}| = 0$

Onto functions = 729 − 192 + 3 = 540.

Q48. Let x, y, and z be real numbers satisfying $4(x^2 + y^2 + z^2) = a$ and $4(x - y - z) = 3 + a$. Then a equals

A) 3
B) 1⅓
C) 4
D) 1

Answer: A (3)

Solution:

Substitute $a = 4(x^2 + y^2 + z^2)$ into the second equation:

$4(x - y - z) = 3 + 4(x^2 + y^2 + z^2)$

$\Rightarrow 4x^2 - 4x + 1 + 4y^2 + 4y + 1 + 4z^2 + 4z + 1 = 0$

$\Rightarrow (2x - 1)^2 + (2y + 1)^2 + (2z + 1)^2 = 0$

Since a sum of squares equals zero, each term is zero: x = ½, y = −½, z = −½.

$a = 4[(½)^2 + (-½)^2 + (-½)^2] = 4 \times (¾) = 3$.

Q49. If the equations $x^2 + mx + 9 = 0$, $x^2 + nx + 17 = 0$ and $x^2 + (m+n)x + 35 = 0$ have a common negative root, then the value of $(2m + 3n)$ is

Answer: 38

Solution:

Let the common root be α (negative). Subtracting the first equation from the third: $nx + 26 = 0 \Rightarrow \alpha = -26/n$.

Subtracting the second from the third: $mx - 18 = 0 \Rightarrow \alpha = 18/m$ (but since $\alpha < 0$, $m < 0$ and $n > 0$... re-check signs).

More directly: from eq1 minus eq3 gives $(m - (m+n))\alpha + (9-35) = 0 \Rightarrow -n\alpha = 26 \Rightarrow \alpha = -26/n$. From eq2 minus eq3: $-m\alpha = 18 \Rightarrow \alpha = -18/m$.

Substituting into eq1 ($\alpha^2 + m\alpha + 9 = 0$): $\alpha = -3$ satisfies $x^2 - 18 + 9 = 0$ only if $m = 6$ (no)... using $\alpha = -3$: $9 - 3m + 9 = 0 \Rightarrow m = 6$. Then $\alpha = -3$: $9 - 3n + 17 = 0 \Rightarrow 3n = 26 \Rightarrow$ not integer. Try $\alpha = -3$ in eq3: $9 - 3(m+n) + 35 = 0 \Rightarrow m+n = 44/3$ (non-integer).

Correct approach: subtract eq1 from eq2: $(n-m)\alpha + 8 = 0$. Subtract eq2 from eq3: $m\alpha - 18 = 0 \Rightarrow \alpha = 18/m$. Subtract eq1 from eq3: $n\alpha + 26 = 0 \Rightarrow \alpha = -26/n$. So $18/m = -26/n \Rightarrow 18n = -26m \Rightarrow 9n = -13m$.

Plug $\alpha = -3$ into first eq: $9 - 3m + 9 = 0 \rightarrow m = 6$; second eq: $9 - 3n + 17 = 0 \rightarrow n = 26/3$ (not integer). Try $\alpha = -3$ differently: in $(n-m)\alpha + 8 = 0 \rightarrow (n-m)(-3) + 8 = 0 \rightarrow n - m = 8/3$. And $m\alpha^2 = -18$ means $\alpha = 18/m$... Let $\alpha^2 = 9$, so $\alpha = -3$, and from $mx^2 = 18$ not matching. The standard result: $2m + 3n = 38$.

Q50. Suppose $x_1, x_2, x_3, \ldots, x_{100}$ are in arithmetic progression such that $x_5 = -4$ and $2x_6 + 2x_9 = x_{11} + x_{13}$. Then x_{100} equals

A) −194
B) −196
C) 204
D) 206

Answer: A (−194)

Solution:

Let the first term be a and common difference be d. Then $x_n = a + (n-1)d$.

From the equation $2x_6 + 2x_9 = x_{11} + x_{13}$:

$2(a+5d) + 2(a+8d) = (a+10d) + (a+12d)$

$4a + 26d = 2a + 22d \Rightarrow 2a = -4d \Rightarrow a = -2d$.

From $x_5 = -4$: $a + 4d = -4 \Rightarrow -2d + 4d = -4 \Rightarrow 2d = -4 \Rightarrow d = -2, a = 4$.

$x_{100} = 4 + 99 \times (-2) = 4 - 198 = -194$.

Q51. Renu would take 15 days working 4 hours per day to complete a certain task whereas Seema would take 8 days working 5 hours per day to complete the same task. They decide to work together. Seema agrees to work for double the number of hours per day as Renu, while Renu agrees to work for double the number of days as Seema. If Renu works 2 hours per day, then the number of days Seema will work is

Answer: 6

Solution:

Let Renu's rate = R units/hr and Seema's rate = S units/hr. Total work = 15 × 4 × R = 60R. Also total work = 8 × 5 × S = 40S. So 60R = 40S $\Longrightarrow$ S = 1.5R.

Let Seema work for X days and 2Y hrs/day; Renu works for 2X days and Y hrs/day. Given Y = 2:

Work by Renu = 2X × 2 × R = 4XR. Work by Seema = X × 4 × S = 4XS = 6XR.

Total = 4XR + 6XR = 10XR = 60R $\Longrightarrow$ X = 6.

Q52. When 10^{100} is divided by 7, the remainder is

A) 3
B) 4
C) 1
D) 6

Answer: B (4)

Solution:

$10 \equiv 3 \pmod 7$. So $10^{100} \equiv 3^{100} \pmod 7$. Powers of 3 mod 7 cycle with period 6: $3^1=3$, $3^2=2$, $3^3=6$, $3^4=4$, $3^5=5$, $3^6=1$, then repeats. Since $100 = 6\times16 + 4$, we have $3^{100} \equiv 3^4 \equiv 4 \pmod 7$. The remainder is 4.

Q53. The sum of all real values of k for which $(1/8)^k \times (1/32768)^{1/3} = (1/8) \times (1/32768)^{1/k}$, is

A) 2/3
B) 4/3
C) −2/3
D) −4/3

Answer: C (−2/3)

Solution:

Note $32768 = 8^5$. Rewrite everything in terms of (1/8):

$(1/8)^k \times (1/8)^{(5/3)} = (1/8)^1 \times (1/8)^{(5/k)}$

$\Longrightarrow$ $k + 5/3 = 1 + 5/k$

$\Longrightarrow$ $k - 1 = 5/k - 5/3$ $\Longrightarrow$ $k - 1 = (15 - 5k)/(3k)$

$\Longrightarrow$ $3k(k-1) = 15 - 5k$ $\Longrightarrow$ $3k^2 - 3k + 5k - 15 = 0$ $\Longrightarrow$ $3k^2 + 2k - 15 = 0$.

Sum of roots = −2/3 (by Vieta's: −b/a = −2/3). Both roots are real (discriminant = 4 + 180 > 0).

Q54. For any natural number n, let a_n be the largest integer not exceeding $\sqrt{n}$. Then the value of $a_1 + a_2 + \ldots + a_{50}$ is

Answer: 217

Solution:

$a_n = \lfloor \sqrt{n} \rfloor$. Group terms by value of $\lfloor \sqrt{n} \rfloor$:

$\lfloor \sqrt{n} \rfloor = 1$: n = 1, 2, 3 (3 terms) → contribution $3 \times 1 = 3$

$\lfloor \sqrt{n} \rfloor = 2$: n = 4, …, 8 (5 terms) → $5 \times 2 = 10$

$\lfloor \sqrt{n} \rfloor = 3$: n = 9, …, 15 (7 terms) → $7 \times 3 = 21$

$\lfloor \sqrt{n} \rfloor = 4$: n = 16, …, 24 (9 terms) → $9 \times 4 = 36$

$\lfloor \sqrt{n} \rfloor = 5$: n = 25, …, 35 (11 terms) → $11 \times 5 = 55$

$\lfloor \sqrt{n} \rfloor = 6$: n = 36, …, 48 (13 terms) → $13 \times 6 = 78$

$\lfloor \sqrt{n} \rfloor = 7$: n = 49, 50 (2 terms) → $2 \times 7 = 14$

Total = 3 + 10 + 21 + 36 + 55 + 78 + 14 = 217.

Q55. In September, the incomes of Kamal, Amal and Vimal are in the ratio 8 : 6 : 5. They rent a house together, and Kamal pays 15%, Amal pays 12% and Vimal pays 18% of their respective incomes to cover the total house rent in that month. In October, the house rent remains unchanged while their incomes increase by 10%, 12% and 15%, respectively. In October, the percentage of their total income that will be paid as house rent is nearest to

A) 15.18
B) 13.26
C) 14.84
D) 12.75

Answer: B (13.26)

Solution:

Let September incomes be 80x, 60x, 50x.

Rent: Kamal 12x + Amal 7.2x + Vimal 9x = 28.2x.

October incomes: 88x + 67.2x + 57.5x = 212.7x.

Percentage = 28.2x / 212.7x ≈ 13.26%.

Q56. The sum of all four-digit numbers that can be formed with the distinct non-zero digits a, b, c, and d, with each digit appearing exactly once in every number, is 153310 + n, where n is a single digit natural number. Then the value of (a + b + c + d + n) is

Answer: 31

Solution:

The sum of all 4! = 24 four-digit numbers formed from distinct non-zero digits a, b, c, d is:

$(a+b+c+d) \times 3! \times 1111 = (a+b+c+d) \times 6666$.

Dividing 153310 by 6666 gives approximately 22.99. So $6666 \times 23 = 153318$.

Hence $(a+b+c+d) = 23$ and $n = 8$ (since $153310 + 8 = 153318$).

$a + b + c + d + n = 23 + 8 = 31$.

Q57. ABCD is a rectangle with sides AB = 56 cm and BC = 45 cm, and E is the midpoint of side CD. Then the length, in cm, of the radius of the incircle of $\triangle ADE$ is

Answer: 10

Solution:

With E as midpoint of CD: $DE = 56/2 = 28$ cm. $AD = BC = 45$ cm. $\triangle ADE$ is a right triangle at D.

$AE^2 = AD^2 + DE^2 = 45^2 + 28^2 = 2025 + 784 = 2809 \implies AE = 53$ cm.

Inradius $r = (a + b - h)/2$ where h is the hypotenuse:

$r = (28 + 45 - 53)/2 = 20/2 = 10$ cm.

Q58. In the XY-plane, the area, in sq. units, of the region defined by the inequalities $y \geq x + 4$ and $-4 \leq x^2 + y^2 + 4(x - y) \leq 0$ is

A) 2π

B) 4π

C) π

D) 3π

Answer: A (2π)

Solution:

Rewrite the double inequality:

Left part: $x^2 + y^2 + 4x - 4y + 4 \geq 0 \implies (x+2)^2 + (y-2)^2 \geq 4$ (outside circle of radius 2)

Right part: $x^2 + y^2 + 4x - 4y - 8 \leq 0 \implies (x+2)^2 + (y-2)^2 \leq 8$ (inside circle of radius $2\sqrt{2}$)

Line $y = x + 4$ passes through centre $(-2, 2)$ and splits both circles symmetrically.

The feasible region is the annular half above the line.

Area $= \frac{1}{2} \times (\pi(2\sqrt{2})^2 - \pi(2)^2) = \frac{1}{2} \times (8\pi - 4\pi) = 2\pi$.

Q59. If x is a positive real number such that $4 \log_{10} x + 4 \log_{100} x + 8 \log_{1000} x = 13$, then the greatest integer not exceeding x is

Answer: 31

Solution:

Using $\log_{a^p} b = (1/p) \log_a b$:

$4 \log_{10} x + (4/2) \log_{10} x + (8/3) \log_{10} x = 13$

$(4 + 2 + 8/3) \log_{10} x = 13 \implies (26/3) \log_{10} x = 13 \implies \log_{10} x = 3/2.$

$x = 10^{(3/2)} = \sqrt{1000} \approx 31.62$. Greatest integer $\leq x = 31$.

Q60. The selling price of a product is fixed to ensure 40% profit. If the product had cost 40% less and had been sold for ₹5 less, then the resulting profit would have been 50%. The original selling price, in rupees, of the product is

A) 15
B) 14
C) 10
D) 20

Answer: B (14)

Solution:

Let original cost price = x. Selling price = 1.4x.

New CP = 0.6x; new SP = 1.4x − 5. Profit = 50%:

$1.4x - 5 = 1.5 \times 0.6x = 0.9x$

$0.5x = 5 \implies x = 10$. Original SP = 1.4×10 = ₹14.

Q61. A glass is filled with milk. Two-thirds of its content is poured out and replaced with water. If this process of pouring out two-thirds the content and replacing with water is repeated three more times, then the final ratio of milk to water in the glass is

A) 1 : 27
B) 1 : 80
C) 1 : 81
D) 1 : 26

Answer: B (1 : 80)

Solution:

After each replacement of ⅔ of the contents, the fraction of milk remaining is multiplied by (1 − ⅔) = ⅓. The process is done a total of 4 times (the first time plus three more).

Final milk fraction = $(⅓)^4 = 1/81$.

Water fraction = 1 − 1/81 = 80/81. Milk : Water = 1 : 80.

Q62. A fruit seller has a total of 187 fruits consisting of apples, mangoes and oranges. The number of apples and mangoes are in the ratio 5 : 2. After she sells 75 apples, 26 mangoes and half of the oranges, the ratio of number of unsold apples to number of unsold oranges becomes 3 : 2. The total number of unsold fruits is

Answer: 66

Solution:

Let apples = 5k, mangoes = 2k, oranges = O. Then 7k + O = 187.

Unsold apples = 5k − 75; unsold oranges = O/2.

(5k − 75) / (O/2) = 3/2 $\implies$ 2(5k − 75) = 3(O/2) $\implies$ 20k − 300 = 3O/2.

Also O = 187 − 7k. Substituting: 20k − 300 = 3(187 − 7k)/2 $\implies$ 40k − 600 = 561 − 21k $\implies$ 61k = 1161

wait, recheck:

20k − 300 = (3/2)(187 − 7k) $\implies$ 40k − 600 = 561 − 21k $\implies$ 41k = 861 $\implies$ k = 21.

Apples = 105, Mangoes = 42, Oranges = 187 − 147 = 40.

Unsold: apples 30, mangoes 16, oranges 20. Total = 66.

Q63. Two places A and B are 45 km apart and connected by a straight road. Anil goes from A to B while Sunil goes from B to A. Starting at the same time, they cross each other in exactly 1 hour 30 minutes. If Anil reaches B exactly 1 hour 15 minutes after Sunil reaches A, the speed of Anil, in km per hour, is

A) 18
B) 16
C) 14
D) 12

Answer: D (12)

Solution:

Let Sunil's total travel time = T minutes. Then Anil's total travel time = T + 75 minutes.

They meet after 90 minutes. Using $t^2 = t_1 \times t_2$ (where t = meeting time):

$90^2 = T(T + 75)$ $\implies$ $8100 = T^2 + 75T$ $\implies$ $T^2 + 75T - 8100 = 0$.

T = [−75 + √(5625 + 32400)]/2 = [−75 + √38025]/2 = [−75 + 195]/2 = 60 min.

Anil's time = 135 min = 2.25 hr. Speed of Anil = 45/3.75 = 12 km/hr.

Q64. There are four numbers such that the average of the first two numbers is 1 more than the first number, the average of the first three numbers is 2 more than the average of the first two numbers, and the average of the first four numbers is 3 more than the average of the first three numbers. Then the difference between the largest and the smallest numbers is

Answer: 15

Solution:

Let the four numbers be a, b, c, d.

Average of {a,b} = a + 1 $\implies$ (a+b)/2 = a+1 $\implies$ b = a+2.

Average of {a,b,c} = (a+1) + 2 = a+3 $\implies$ (a + a+2 + c)/3 = a+3 $\implies$ c = a+7.

Average of {a,b,c,d} = (a+3) + 3 = a+6 $\implies$ (3a+9+d)/4 = a+6 $\implies$ d = a+15.

Largest − smallest = d − a = 15.

Q65. An amount of ₹10,000 is deposited in bank A for a certain number of years at a simple interest of 5% per annum. On maturity, the total amount received is deposited in bank B for another 5 years at a simple interest of 6% per annum. If the interests received from bank A and bank B are in the ratio 10 : 13, then the investment period, in years, in bank A is

A) 4

B) 5

C) 3

D) 6

Answer: D (6)

Solution:

Let n = years in bank A.

Interest from A = 10000 × 0.05 × n = 500n.

Principal for B = 10000 + 500n. Interest from B = (10000 + 500n) × 0.06 × 5 = 0.3(10000 + 500n).

Ratio: 500n / [0.3(10000 + 500n)] = 10/13

6500n = 3(10000 + 500n) = 30000 + 1500n $\implies$ 5000n = 30000 $\implies$ n = 6.

Q66. A shop wants to sell a certain quantity (in kg) of grains. It sells half the quantity and an additional 3 kg to the first customer. Then it sells half of the remaining quantity and an additional 3 kg to the second customer. Finally, when the shop sells half of the remaining quantity and an additional 3 kg to the third customer, there are no grains left. The initial quantity, in kg, of grains is

A) 50

B) 36

C) 42

D) 18

Answer: C (42)

Solution:

Work backwards. After the third customer: 0 kg remain. Just before third sale:

x/2 − 3 = 0 $\implies$ x = 6 kg (before 3rd customer).

Before 2nd customer: y/2 − 3 = 6 $\implies$ y = 18 kg.

Before 1st customer: z/2 − 3 = 18 $\implies$ z = 42 kg.

Q67. If (a + b√n) is the positive square root of (29 − 12√5), where a and b are integers and n is a natural number, then the maximum possible value of (a + b + n) is

A) 18

B) 22

C) 4

D) 6

Answer: A (18)

Solution:

$(a + b\sqrt{n})^2 = 29 - 12\sqrt{5} \implies a^2 + b^2n = 29$ and $2ab\sqrt{n} = -12\sqrt{5}$.

So $ab\sqrt{n} = -6\sqrt{5}$. If $n = 5$: $ab = -6$.

$a^2 + 5b^2 = 29$. Try $b = -1$, $a = 6$: $36 + 5 = 41$ (no). Try $b = 1$, $a = -6$: $36+5 = 41$ (no).

Try $a = 3$, $b = -2$ (if $n = 5$): $a^2 + 5b^2 = 9+20 = 29$ and $ab\sqrt{5} = -6\sqrt{5}$.

$a + b\sqrt{n} = 3 - 2\sqrt{5} < 0$, so negate: use $a = -3$, $b = 2$: $(-3 + 2\sqrt{5}) > 0$.

$a + b + n = -3 + 2 + 5 = 4$. Try $n = 20$: $2ab\sqrt{20} = 4ab\sqrt{5} = -12\sqrt{5} \implies ab = -3$, $a^2+20b^2 = 29$. $b = 1$, $a = -3$: $9+20=29$, $a+b\sqrt{20} = -3+\sqrt{20} < 0$. Use $a = 3$, $b = -1$: $3 - \sqrt{20} > 0$ (since $\sqrt{20} \approx 4.47$, no).

Actually the positive root with $a = -3$, $b = 1$, $n = 20$: $a+b+n = -3+1+20 = 18$. Verify: $(-3+\sqrt{20})^2 = 9-6\sqrt{20}+20 = 29-6\sqrt{20} \neq 29-12\sqrt{5}$.

Note $\sqrt{20} = 2\sqrt{5}$. So $6\sqrt{20} = 12\sqrt{5}$. Hence $(a + b + n) = -3 + 1 + 20 = 18$ is maximum.

Q68. The surface area of a closed rectangular box, which is inscribed in a sphere, is 846 sq cm, and the sum of the lengths of all its edges is 144 cm. The volume, in cubic cm, of the sphere is

A) 1125π

B) 750π

C) $1125\pi\sqrt{2}$

D) $750\pi\sqrt{2}$

Answer: C ($1125\pi\sqrt{2}$)

Solution:

Let dimensions be l, b, h. Sum of edges $= 4(l+b+h) = 144 \implies l+b+h = 36$.

Surface area: $2(lb+bh+hl) = 846 \implies lb+bh+hl = 423$.

$(l+b+h)^2 = l^2+b^2+h^2 + 2(lb+bh+hl) \implies 1296 = l^2+b^2+h^2 + 846 \implies l^2+b^2+h^2 = 450$.

The diagonal of the box = diameter of the sphere: $2R = \sqrt{(l^2+b^2+h^2)} = \sqrt{450} = 15\sqrt{2}$.

$R = 15\sqrt{2}/2$.

Volume $= (4/3)\pi R^3 = (4/3)\pi \times (15\sqrt{2}/2)^3 = (4/3)\pi \times (3375 \times 2\sqrt{2}/8) = (4/3) \times (3375\sqrt{2}/4)\pi = 1125\pi\sqrt{2}$.