CAT 2022 | SHIFT-1 | QUESTION PAPER

Time: 120 Mins

Important Instructions

(i)   Total Number of Questions: 66

(ii)   Number of Questions in Verbal Ability and Reading Comprehension (VARC): 24

(iii)   Number of Questions in Data Interpretation and Logical Reasoning (DILR): 20

(iv)   Number of Questions in Quantitative Ability (QA): 22

(v)   40 minutes are allotted to attempt each section.

(vi)   4 answer options for each MCQ type question.

(vii)   Answers are typed in the given space on the computer screen for Non-MCQ.

(viii) For each correct answer: + 3 marks

(ix)   Negative marking (Applicable for wrong answers in MCQs): - 1 mark

Verbal Ability and Reading Comprehension (VARC)

Passage 1

Directions (Q. 1 to 4): *Read the following passage carefully and answer the questions that follow.*

The Chinese have two different concepts of a copy. Fangzhipin . . . are imitations where the difference from the original is obvious. These are small models or copies that can be purchased in a museum shop, for example. The second concept for a copy is fuzhipin . . . They are exact reproductions of the original, which, for the Chinese, are of equal value to the original. It has absolutely no negative connotations. The discrepancy with regard to the understanding of what a copy is has often led to misunderstandings and arguments between China and Western museums. The Chinese often send copies abroad instead of originals in the firm belief that they are not essentially different from the originals. The rejection that then comes from the Western museums is perceived by the Chinese as an insult. . . .

The Far Eastern notion of identity is also very confusing to the Western observer. The Ise Grand Shrine [in Japan] is 1,300 years old for the millions of Japanese people who go there on pilgrimage every year. But in reality, this temple complex is completely rebuilt from scratch every 20 years. . . .

The cathedral of Freiburg Minster in southwest Germany is covered in scaffolding almost all year round. The sandstone from which it is built is a very soft, porous material that does not withstand natural erosion by rain and wind. After a while, it crumbles. As a result, the cathedral is continually being examined for damage, and eroded stones are replaced. And in the cathedral's dedicated workshop, copies of the damaged sandstone figures are constantly being produced. Of course, attempts are made to preserve the stones from the Middle Ages for as long as possible. But at some point, they too are removed and replaced with new stones.

Fundamentally, this is the same operation as with the Japanese shrine, except in this case the production of a replica takes place very slowly and over long periods of time. . . . In the field of art as well, the idea of an unassailable original developed historically in the Western world. Back in the 17th century [in the West], excavated artworks from antiquity were treated quite differently from today. They were not restored in a way that was faithful to the original. Instead, there was massive intervention in these works, changing their appearance. . . .

It is probably this intellectual position that explains why Asians have far fewer scruples about cloning than Europeans. The South Korean cloning researcher Hwang Woo-suk, who attracted worldwide attention

with his cloning experiments in 2004, is a Buddhist. He found a great deal of support and followers among Buddhists, while Christians called for a ban on human cloning. . . . Hwang legitimised his cloning experiments with his religious affiliation: 'I am Buddhist, and I have no philosophical problem with cloning. And as you know, the basis of Buddhism is that life is recycled through reincarnation. In some ways, I think, therapeutic cloning restarts the circle of life.'

Q. 1. **Which one of the following scenarios is unlikely to follow from the arguments in the passage?**

1. A 17th century British painter would have no problem adding personal touches when restoring an ancient Roman painting.

2. A 17th century French artist who adhered to a Christian worldview would need to be completely true to the original intent of a painting when restoring it.

3. A 20th century Japanese Buddhist monk would value a reconstructed shrine as the original.

4. A 21st century Christian scientist is likely to oppose cloning because of his philosophical orientation.

Q. 2. **Which one of the following statements does not correctly express the similarity between the Ise Grand Shrine and the cathedral of Freiburg Minster?**

1. Both are continually undergoing restoration.

2. Both were built as places of worship.

3. Both will one day be completely rebuilt.

4. Both can be regarded as very old structures.

Q. 3. **The value that the modern West assigns to "an unassailable original" has resulted in all of the following EXCEPT:**

1. it discourages them from simultaneous displays of multiple copies of a painting.

2. it allows regular employment for certain craftsmen.

3. it discourages them from making interventions in ancient art.

4. it discourages them from carrying out human cloning.

Q. 4. **Based on the passage, which one of the following copies would a Chinese museum be unlikely to consider as having less value than the original?**

1. Pablo Picasso's painting of Vincent van Gogh's original painting, identical in every respect.

2. Pablo Picasso's miniaturised, but otherwise faithful and accurate painting of Vincent van Gogh's original painting.

3. Pablo Picasso's painting of Vincent van Gogh's original painting, bearing Picasso's signature.

4. Pablo Picasso's photograph of Vincent van Gogh's original painting, printed to exactly the same scale.

Passage 2

Directions (Q. 5 to 8): *Read the following passage carefully and answer the questions that follow.*

Stoicism was founded in 300 BC by the Greek philosopher Zeno and survived in the Roman era until about AD 300. According to the Stoics, emotions consist of two movements. The first movement is the immediate feeling and other reactions (e.g., physiological response) that occur when a stimulus or event occurs. For instance, consider what could have happened if an army general accused Marcus Aurelius of treason in front of other officers. The first movement for Marcus may have been (internal) surprise and anger in response to this insult, accompanied perhaps by some involuntary physiological and expressive responses such as face flushing and a movement of the eyebrows. The second movement is what one does next about the emotion. Second movement behaviours occur after thinking and are under one's control. Examples of second movements for Marcus might have included a plot to seek revenge, actions signifying deference and appeasement, or perhaps proceeding as he would have proceeded whether or not this event occurred: continuing to lead the Romans in a way that Marcus Aurelius believed best benefited them. In the Stoic view, choosing a reasoned, unemotional response as the second movement is the only appropriate response.

The Stoics believed that to live the good life and be a good person, we need to free ourselves of nearly all desires such as too much desire for money, power, or sexual gratification. Prior to second movements, we can consider what is important in life. Money, power, and excessive sexual gratification are not important. Character, rationality, and kindness are important. The Epicureans, first associated with the Greek philosopher Epicurus . . . held a similar view, believing that people should enjoy simple pleasures, such as good conversation, friendship, food, and wine, but not be indulgent in these pursuits and not follow passion for those things that hold no real value like power and money. As Oatley (2004) states, "the Epicureans articulated a view—enjoyment of relationship with friends, of things that are real rather than illusory, simple rather than artificially inflated, possible rather than vanishingly unlikely—that is certainly relevant today" . . . In sum, these ancient Greek and Roman philosophers saw emotions, especially strong ones, as potentially dangerous. They viewed emotions as experiences that needed to be [reined] in and controlled.

As Oatley (2004) points out, the Stoic idea bears some similarity to Buddhism. Buddha, living in India in the 6th century BC, argued for cultivating a certain attitude that decreases the probability of (in Stoic terms) destructive second movements. Through meditation and the right attitude, one allows emotions to happen to oneself (it is impossible to prevent this), but one is advised to observe the emotions without necessarily acting on them; one achieves some distance and decides what has value and what does not have value. Additionally, the Stoic idea of developing virtue in oneself, of becoming a good person, which the Stoics believed we could do because we have a touch of the divine, laid the foundation for the three monotheistic religions: Judaism, Christianity, and Islam . . . As with Stoicism, tenets of these religions include controlling our emotions lest we engage in sinful behaviour.

Q. 5. **"Through meditation and the right attitude, one allows emotions to happen to oneself (it is impossible to prevent this), but one is advised to observe the emotions without necessarily acting on them; one achieves some distance and decides what has value and what does not have value." In the context of the passage, which one of the following is not a possible implication of the quoted statement?**

1. Meditation allows certain out-of-body experiences that permit us to gain the distance necessary to control our emotions.

2. The observation of emotions in a distant manner corresponds to the second movement referred to earlier in the passage.

3. "Meditation and the right attitude", in this instance, implies an initially passive reception of all experiences.

4. Emotional responses can make it difficult to distinguish valuable experiences from valueless experiences.

Q. 6. **Which one of the following statements would be an accurate inference from the example of Marcus Aurelius?**

1. Marcus Aurelius was one of the leaders of the Roman army.

2. Marcus Aurelius plotted revenge in his quest for justice.

3. Marcus Aurelius was humiliated by the accusation of treason in front of the other officers.

4. Marcus Aurelius was a Stoic whose philosophy survived in the Roman era.

Q. 7. **Which one of the following statements, if false, could be seen as contradicting the facts/arguments in the passage?**

1. In the Epicurean view, indulging in simple pleasures is not desirable.

2. Despite practising meditation and cultivating the right attitude, emotions cannot ever be controlled.

3. In the Stoic view, choosing a reasoned, unemotional response as the first movement is an appropriate response to emotional situations.

4. The Greek philosopher Zeno survived in the Roman era until about AD 300.

Q. 8. **On the basis of the passage, which one of the following statements can be regarded as true?**

1. The Epicureans believed in controlling all emotions.

2. The Stoic influences can be seen in multiple religions.

3. There were no Stoics in India at the time of the Roman civilisation.

4. The Stoics valourised the pursuit of money, power, and sexual gratification.

Passage 3

Directions (Q. 9 to 12): *Read the following passage carefully and answer the questions that follow.*

Stories concerning the Undead have always been with us. From out of the primal darkness of Mankind's earliest years, come whispers of eerie creatures, not quite alive (or alive in a way which we can understand), yet not quite dead either. These may have been ancient and primitive deities who dwelt deep in the surrounding forests and in remote places, or simply those deceased who refused to remain in their tombs and who wandered about the countryside, physically tormenting and frightening those who were still alive. Mostly they were ill-defined—strange sounds in the night beyond the comforting glow of the fire, or a shape, half-glimpsed in the twilight along the edge of an encampment. They were vague and indistinct, but they were always there with the power to terrify and disturb. They had the power to touch the minds of our early ancestors and to fill them with dread. Such fear formed the basis of the earliest tales although the source and exact nature of such terrors still remained very vague.

And as Mankind became more sophisticated, leaving the gloom of their caves and forming themselves into recognisable communities—towns, cities, whole cultures—so the Undead travelled with them, inhabiting their folklore just as they had in former times. Now, they began to take on more definite shapes. They became walking cadavers; the physical embodiment of former deities and things which had existed alongside Man since the Creation. Some still remained vague and ill-defined but, as Mankind strove to explain the horror which it felt towards them, such creatures emerged more readily into the light.

In order to confirm their abnormal status, many of the Undead were often accorded attributes, which defied the natural order of things—the power to transform themselves into other shapes, the ability to sustain themselves by drinking human blood, and the ability to influence human minds across a distance. Such powers—described as supernatural—only [lent] an added dimension to the terror that humans felt regarding them.

And it was only natural, too, that the Undead should become connected with the practice of magic. From very early times, Shamans and witchdoctors had claimed at least some power and control over the spirits of departed ancestors, and this has continued down into more 'civilised' times. Formerly, the invisible spirits and forces that thronged around men's earliest encampments, had spoken "through" the tribal Shamans but now, as entities in their own right, they were subject to magical control and could be physically summoned by a competent sorcerer. However, the relationship between the magician and an Undead creature was often a very tenuous and uncertain one. Some sorcerers might have even become Undead entities once they died, but they might also have been susceptible to the powers of other magicians when they did.

From the Middle Ages and into the Age of Enlightenment, theories of the Undead continued to grow and develop. Their names became more familiar—werewolf, vampire, ghoul—each one certain to strike fear into the hearts of ordinary humans.

Q. 9. **Which one of the following observations is a valid conclusion to draw from the statement, "From out of the primal darkness of Mankind's earliest years, come whispers of eerie creatures, not quite alive (or alive in a way which we can understand), yet not quite dead either."?**

1. We can understand the lives of the eerie creatures in Mankind's early years through their whispers in the darkness.
2. Long ago, eerie creatures used to whisper in the primal darkness that they were not quite dead.
3. Mankind's early years were marked by a belief in the existence of eerie creatures that were neither quite alive nor dead.
4. Mankind's primal years were marked by creatures alive with eerie whispers, but seen only in the darkness.

Q. 10. **All of the following statements, if false, could be seen as being in accordance with the passage, EXCEPT:**

1. The growing sophistication of Mankind meant that humans stopped believing in the Undead.
2. The transition from the Middle Ages to the Age of Enlightenment saw new theories of the Undead.
3. The Undead remained vague and ill-defined, even as Mankind strove to understand the horror they inspired.

4. The relationship between Shamans and the Undead was believed to be a strong and stable one.

Q. 11. Which one of the following statements best describes what the passage is about?

1. The writer describes the ways in which the Undead come to be associated with Shamans and the practice of magic.

2. The passage describes the failure of human beings to fully comprehend their environment.

3. The writer discusses the transition from primitive thinking to the Age of Enlightenment.

4. The passage discusses the evolution of theories of the Undead from primitive thinking to the Age of Enlightenment.

Q. 12. "In order to confirm their abnormal status, many of the Undead were often accorded attributes, which defied the natural order of things . . ." Which one of the following best expresses the claim made in this statement?

1. The Undead are deified in nature's order by giving them divine attributes.

2. According the Undead, an abnormal status is to reject the natural order of things.

3. Human beings conceptualise the Undead as possessing abnormal features.

4. The natural attributes of the Undead are rendered abnormal by changing their status.

Passage 4

Directions (Q. 13 to 16): *Read the following passage carefully and answer the questions that follow.*

Critical theory of technology is a political theory of modernity with a normative dimension. It belongs to a tradition extending from Marx to Foucault and Habermas according to which advances in the formal claims of human rights take centre stage while in the background, centralisation of ever more powerful public institutions and private organisations imposes an authoritarian social order.

Marx attributed this trajectory to the capitalist rationalisation of production. Today, it marks many institutions besides the factory and every modern political system, including so-called socialist systems. This trajectory arose from the problems of command over a disempowered and deskilled labour force; but everywhere [that] masses are organised – whether it be Foucault's prisons or Habermas's public sphere – the same pattern prevails. Technological design and development is shaped by this pattern as the material base of a distinctive social order. Marcuse would later point to a "project" as the basis of what he called rather confusingly "technological rationality." Releasing technology from this project is a democratic political task.

In accordance with this general line of thought, critical theory of technology regards technologies as an environment rather than as a collection of tools. We live today with and even within technologies that determine our way of life. Along with the constant pressures to build centres of power, many other social values and meanings are inscribed in technological design. A hermeneutics of technology must make explicit the meanings implicit in the devices we use and the rituals they script. Social histories of technologies such as the bicycle, artificial lighting or firearms have made important contributions to this type of analysis. Critical theory of technology attempts to build a methodological approach on the lessons of these histories.

As an environment, technologies shape their inhabitants. In this respect, they are comparable to laws and customs. Each of these institutions can be said to represent those who live under their sway through privileging certain dimensions of their human nature. Laws of property represent the interest in ownership and control. Customs such as parental authority represent the interest of childhood in safety and growth. Similarly, the automobile represents its users in so far as they are interested in mobility. Interests such as these constitute the version of human nature sanctioned by society.

This notion of representation does not imply an eternal human nature. The concept of nature as non-identity in the Frankfurt School suggests an alternative. On these terms, nature is what lies at the limit of history, at the point at which society loses the capacity to imprint its meanings on things and control them effectively. The reference here is, of course, not to the nature of natural science, but to the lived nature in which we find ourselves and which we are. This nature reveals itself as that which cannot be totally encompassed by the machinery of society. For the Frankfurt School, human nature, in all its transcending force, emerges out

of a historical context as that context is [depicted] in illicit joys, struggles and pathologies. We can perhaps admit a less romantic . . . conception in which those dimensions of human nature recognised by society are also granted theoretical legitimacy.

Q. 13. Which one of the following statements contradicts the arguments of the passage?

1. The problems of command over a disempowered and deskilled labour force gave rise to similar patterns of the capitalist rationalisation of production wherever masses were organised.

2. Paradoxically, the capitalist rationalisation of production is a mark of so-called socialist systems as well.

3. Marx's understanding of the capitalist rationalisation of production and Marcuse's understanding of a "project" of "technological rationality" share theoretical inclinations.

4. Masses are organised in patterns set by Foucault's prisons and Habermas' public sphere.

Q. 14. Which one of the following statements could be inferred as supporting the arguments of the passage?

1. The romantic conception of nature referred to by the passage is the one that requires theoretical legitimacy.

2. Nature decides the point at which society loses its capacity to control history.

3. It is not human nature, but human culture that is represented by institutions such as law and custom.

4. Technologies form the environmental context and shape the contours of human society.

Q. 15. Which one of the following statements best reflects the main argument of the fourth paragraph of the passage?

1. Automobiles represent the interest in mobility present in human nature.

2. Technology, laws, and customs are not unlike each other if considered as institutions.

3. Technology, laws, and customs are comparable, but dissimilar phenomena.

4. Technological environments privilege certain dimensions of human nature as effectively as laws and customs.

Q. 16. All of the following claims can be inferred from the passage, EXCEPT:

1. Analyses of technologies must engage with their social histories to be able to reveal their implicit and explicit meanings for us.

2. Technologies seek to privilege certain dimensions of human nature at a high cost to the lived nature.

3. The critical theory of technology argues that, as issues of human rights become more prominent, we lose sight of the ways in which the social order becomes more authoritarian.

4. The significance of parental authority to children's safety does not therefore imply that parental authority is a permanent aspect of human nature.

Q. 17. 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. Fish skin collagen has excellent thermo-stability and tensile strength making it ideal for use as bandage that adheres to the skin and adjusts to body movements.

2. Collagen, one of the main structural proteins in connective tissues in the human body, is well known for promoting skin regeneration.

3. Diseases and bacteria that affect fish are different from most human pathogens, and fish skin is also a cheap and readily available material.

4. The risk of introducing disease agents into other species through the use of pig and cow collagen proteins for wound healing has inhibited its broader applications in the medical field.

Q. 18. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

All that we think we know about how life hangs together is really some kind of illusion that we have perpetrated on ourselves because of our limited vision. What appear to be inanimate objects such as stones turn out not only to be alive in the same way that we are, but also in many infinitesimal ways to be affected by stimuli just as humans are. The distinction between animate and inanimate simply cannot be made when you enter the world of quantum mechanics and try to determine how those apparent subatomic particles, of which you and everything else in our universe is composed, are all tied together. The point is that physics and metaphysics show there is a pattern to the universe that goes beyond our capacity to grasp it with our brains.

1. Quantum physics indicates that an astigmatic view of reality results in erroneous assumptions about the universe.

2. The inanimate world is both sentient and cognizant like its animate counterpart.

3. The effect of stimuli is similar in inanimate objects when compared to animate objects or living beings.

4. Arbitrary distinctions between inanimate and animate objects disappear at the scale at which quantum mechanics works.

Q. 19. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

It's not that modern historians of medieval Africa have been ignorant about contacts between Ethiopia and Europe; they just had the power dynamic reversed. The traditional narrative stressed Ethiopia as weak and in trouble in the face of aggression from external forces, so Ethiopia sought military assistance from their fellow Christians to the north. But the real story, buried in plain sight in medieval diplomatic texts, simply had not yet been put together by modern scholars. Recent research pushes scholars of medieval Europe to imagine a much more richly connected medieval world: at the beginning of the so-called Age of Exploration, there is evidence that the kings of Ethiopia were sponsoring

their own missions of diplomacy, faith and commerce.

1. Medieval texts have been 'cherry-picked' to promote a view of Ethiopia as weak and in need of Europe's military help with aggressive neighbours, but recent studies reveal it was a well-connected and outward-looking culture.

2. Historians were under the illusion that Ethiopia needed military protection from their neighbours, but in fact, the country had close commercial and religious connections with them.

3. Medieval historical sources selectively promoted the narrative that powerful European forces were called to protect weak African civilisations such as Ethiopia, but this is far from reality.

4. Medieval texts have documented how strong connections between the Christian communities of Ethiopia and Europe were invaluable in establishing military and trade links between the two civilisations.

Q. 20. 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. The creative element in product design has become of paramount importance as it is one of the few ways a firm or industry can sustain a competitive advantage over its rivals.

2. In fact, the creative element in the value of world industry would be larger still, if we added the contribution of the creative element in other industries, such as the design of tech accessories.

3. The creative industry is receiving a lot of attention today as its growth rate is faster than that of the world economy as a whole.

4. It is for this reason that today's trade issues are increasingly involving intellectual property, as Western countries have an interest in protecting their revenues along with freeing trade in non-tangibles.

Q. 21. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Petitioning is an expeditious democratic tradition, used frequently in prior centuries, by which citizens can bring issues directly to governments. As expressions of collective voice, they support procedural democracy by shaping agendas. They can also recruit citizens to causes, give voice to the voteless, and apply the discipline of rhetorical argument that clarifies a point of view. By contrast, elections are limited in several respects: they involve only a few candidates, and thus fall far short of a representative democracy. Further, voters' choices are not specific to particular policies or laws, and elections are episodic, whereas the voice of the people needs to be heard and integrated constantly into a democratic government.

1. By giving citizens greater control over shaping political and democratic agendas, political petitions are invaluable as they represent an ideal form of a representative democracy.

2. Petitioning has been important to democratic functioning, as it supplements the electoral process by enabling ongoing engagement with the government.

3. Petitioning is definitely more representative of the collective voice, and the functioning of a democratic government could improve if we relied more on petitioning rather than holding periodic elections.

4. Citizens become less inclined to petitioning as it enables vocal citizens to shape political agendas, but this needs to change to strengthen democracies today.

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

1. Some company leaders are basing their decisions on locating offices to foster innovation and growth, as their best-performing inventors suffered the greatest productivity losses when their commutes grew longer.

2. Shorter commutes support innovation by giving employees more time in the office and greater opportunities for in-person collaboration, while removing the physical strain of a long commute.

3. This is not always the case: remote work does not automatically lead to greater creativity and productivity as office water-cooler conversations are also very important for innovation.

4. Some see the link between long commutes and productivity as support for work-from-home scenarios, as many workers have grown accustomed to their commute-free arrangements during the pandemic.

Q. 23. There is a sentence that is missing in the paragraph given below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: Having made citizens more and less knowledgeable than their predecessors, the Internet has proved to be both a blessing and a curse.

Paragraph: Never before has a population, nearly all of whom has enjoyed at a least a secondary school education, been exposed to so much information, whether in newspapers and magazines or through YouTube, Google, and Facebook. ___(1) ___. Yet, it is not clear that people today are more knowledgeable than their barely literate predecessors. Contemporary advances in technology offered more serious and inquisitive students access to realms of knowledge previously unimaginable and unavailable. ___(2)___. But such readily available knowledge leads many more students away from serious study, the reading of actual texts, and toward an inability to write effectively and grammatically. ___(3)___. It has let people choose sources that reinforce their opinions rather than encouraging them to question inherited beliefs. ___(4)___.

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

Q. 24. **There is a sentence that is missing in the paragraph given below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the following sentence would best fit.**

Sentence: Easing the anxiety and pressure of having a "big day" is part of the appeal for many couples who marry in secret.

Paragraph: Wedding season is upon us and – after two years of Covid chaos that saw nuptials scaled back– you may think the temptation would be to go all out. ___(1)___. But instead of expanding the guest list, many couples are opting to have entirely secret ceremonies. With Covid case numbers remaining high and the cost of living crisis meaning that many couples are feeling the pinch, it's no wonder that some are less than eager to send out invites. ___(2)___. Plus, it can't hurt that in celebrity circles getting married in secret is all the rage. ___(3)___. "I would definitely say that secret weddings are becoming more common," says Landis Bejar, the founder of a therapy practice, which specialises in helping brides and grooms manage wedding stress. "People are looking for ways to get out of the spotlight and avoid the pomp and circumstance of weddings. ___(4)___. They just want to get to the part where they are married."

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

Data Interpretation and Logical Reasoning (DILR)

Directions (Q. 1 to 5): *Read the instructions given and answer the questions that follow.*
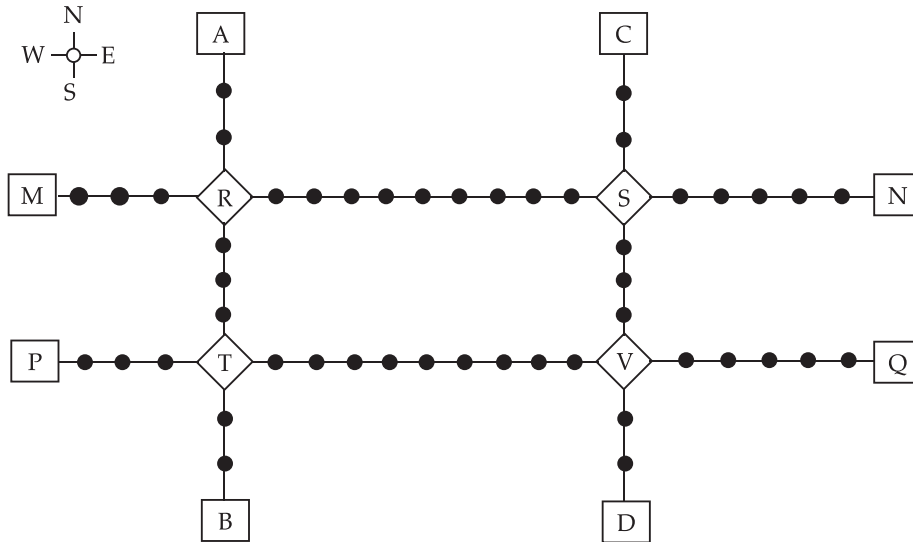
Given above is the schematic map of the metro lines in a city with rectangles denoting terminal stations (e.g. A), diamonds denoting junction stations (e.g. R) and small filled-up circles denoting other stations. Each train runs either in east-west or north-south direction, but not both. All trains stop for 2 minutes at each of the junction stations on the way and for 1 minute at each of the other stations. It takes 2 minutes to reach the next station for trains going in east-west direction and 3 minutes to reach the next station for trains going in north-south direction. From each terminal station, the first train starts at 6 am; the last train leaves the terminal station at midnight. Otherwise, during the service hours, there are metro services every 15 minutes in the north-south lines and every 10 minutes in the east-west lines. A train must rest for at least 15 minutes after completing a trip at the terminal station, before it can undertake the next trip in the reverse direction. (All questions are related to this metro service only. Assume that if someone reaches a station exactly at the time a train is supposed to leave, (s)he can catch that train.)

Q. 1. If Hari is ready to board a train at 8:05 am from station M, then when is the earliest that he can reach station N?

    1. 9:06 am   **2.** 9:01 am

    3. 9:13 am   **4.** 9:11 am

Q. 2. If Priya is ready to board a train at 10:25 am from station T, then when is the earliest that she can reach station S?

    1. 11:28 am   **2.** 11:12 am

    3. 11:07 am   **4.** 11:22 am

Q. 3. Haripriya is expected to reach station S late. What is the latest time by which she must be ready to board at station S if she must reach station B before 1 am via station R?

    1. 11:39 pm   **2.** 11:35 pm

    3. 11:49 am   **4.** 11:43 pm

Q. 4. What is the minimum number of trains that are required to provide the service on the AB line (considering both north and south directions)?

Q. 5. What is the minimum number of trains that are required to provide the service in this city?

Directions (Q. 6 to 10): *Answer the questions on the basis of the information given below.*

The management of a university hockey team was evaluating the performance of four women players - Amla, Bimla, Harita and Sarita for their possible selection in the university team for the next year. For this purpose, the management was looking at the number of goals scored by them in the past 8 matches, numbered 1 through 8. The four players together had scored a total of 12 goals in these matches. In the 8 matches, each of them had scored at least one goal. No two players had scored the same total number of goals.

The following facts are known about the goals scored by these four players only. All the questions refer only to the goals scored by these four players.

1. Only one goal was scored in every even numbered match.

2. Harita scored more goals than Bimla.

3. The highest goal scorer scored goals in exactly 3 matches, including Match 4 and Match 8.

4. Bimla scored a goal in Match 1 and one each in three other consecutive matches.

5. An equal number of goals were scored in Match 3 and Match 7, which was different from the number of goals scored in either Match 1 or Match 5.

6. The match in which the highest number of goals was scored was unique and it was not Match 5.

Q. 6. How many goals were scored in Match 7?

1. 3
2. 1
3. 2
4. Cannot be determined

Q. 7. Which of the following is the correct sequence of goals scored in matches 1, 3, 5 and 7?

1. 5, 1, 0, 1   2. 3, 1, 2, 1
3. 4, 1, 2, 1   4. 3, 2, 1, 2

Q. 8. Which of the following statement(s) is/are true?

Statement-1: Amla and Sarita never scored goals in the same match.

Statement-2: Harita and Sarita never scored goals in the same match.

1. None of the statements
2. Statement-1 only
3. Statement-2 only
4. Both the statements

Q. 9. Which of the following statement(s) is/are false?

Statement-1: In every match, at least one player scored a goal.

Statement-2: No two players scored goals in the same number of matches.

1. Statement-2 only
2. None of the statements
3. Both the statements
4. Statement-1 only

Q. 10. If Harita scored goals in one more match as compared to Sarita, which of the following statement(s) is/are necessarily true?

Statement-1: Amla scored goals in consecutive matches.

Statement-2: Sarita scored goals in consecutive matches.

1. None of the statements
2. Both the statements
3. Statement-1 only
4. Statement-2 only

Directions (Q. 11 to 15): *Answer the questions based on the following information.*

Adhara, Bithi, Chhaya, Dhanavi, Esther, and Fathima are the interviewers in a process that awards funding for new initiatives. Every interviewer individually interviews each of the candidates individually and awards a token only if she recommends funding. A token has a face value of 2, 3, 5, 7, 11, or 13. Each interviewer awards tokens of a single face value only.

Once all six interviews are over for a candidate, the candidate receives a funding that is ₹ 1000 times the product of the face values of all the tokens. For example, if a candidate has tokens with face values 2, 5, and 7, then they get a funding of ₹ 1000 × (2 × 5 × 7) = ₹ 70,000.

Pragnyaa, Qahira, Rasheeda, Smera, and Tantra were five candidates who received funding. The funds they received in descending order, were ₹ 390,000, ₹ 210,000, ₹ 165,000, ₹ 77,000, and ₹ 66,000.

The following additional facts are known:

1. Fathima awarded tokens to everyone except Qahira, while Adhara awarded tokens to no one except Pragnyaa.

2. Rashida received the highest number of tokens that anyone received, but she did not receive one from Esther.

3. Bithi awarded a token to Smera but not to Qahira, while Dhanavi awarded a token to Qahira but not to Smera.

Q. 11. How many tokens did Qahira receive?

Q. 12. How among the following definitely received a token from Bithi but not from Dhanavi?

　　1. Qahira　　　　**2.** Pragnyaa

　　3. Rasheeda　　　**4.** Tantra

Q. 13. How many tokens did Chhaya award?

Q. 14. How many tokens did Smera receive?

Q. 15. Which of the following could be the amount of funding that Tantra received?

(a) ₹ 66,000

(b) ₹ 165,000

　　1. Both (a) and (b)　　**2.** Neither (a) nor (b)

　　3. Only (b)　　　　　　**4.** Only (a)

Directions (Q. 16 to 20): *Answer the questions based on the following information.*

There are 15 girls and some boys among the graduating students in a class. They are planning a get-together, which can be either a 1-day event, or a 2-day event, or a 3-day event. There are 6 singers in the class; 4 of them are boys. There are 10 dancers in the class; 4 of them are girls. No dancer in the class is a singer.

Some students are not interested in attending the get-together. Those students who are interested in attending a 3-day event are also interested in attending a 2-day event; those who are interested in attending a 2-day event are also interested in attending a 1-day event.

The following facts are also known:

1. All the girls and 80% of the boys are interested in attending a 1-day event. 60% of the boys are interested in attending a 2-day event.

2. Some of the girls are interested in attending a 1-day event, but not a 2-day event; some of the other girls are interested in attending both.

3. 70% of the boys who are interested in attending a 2-day event are neither singers nor dancers. 60% of the girls who are interested in attending a 2-day event are neither singers nor dancers.

4. No girl is interested in attending a 3-day event. All male singers and 2 of the dancers are interested in attending a 3-day event.

5. The number of singers interested in attending a 2-day event is one more than the number of dancers interested in attending a 2-day event.

Q. 16. How many boys are there in the class?

Q. 17. Which of the following can be determined from the given information?

　　I.　The number of boys who are interested in attending a 1-day event and are neither dancers nor singers.

　　II.　The number of female dancers who are interested in attending a 1-day event.

　　1. Neither I nor II　　**2.** Only II

　　3. Only I　　　　　　　**4.** Both I and II

Q. 18. What fraction of the class is interested in attending a 2-day event?

　　1. 9/13　　　　　　**2.** 2/3

　　3. 7/10　　　　　　**4.** 7/13

Q. 19. What BEST can be concluded about the number of male dancers who are interested in attending a 1-day event?

　　1. 6　　　　　　　　**2.** 4 or 6

　　3. 5　　　　　　　　**4.** 5 or 6

Q. 20. How many female dancers are interested in attending a 2-day event?

　　1. Cannot be determined

　　2. 2

　　3. 1

　　4. 0

Quantitative Aptitude (QA)

Q. 1. Pinky is standing in a queue at a ticket counter. Suppose the ratio of the number of persons standing ahead of Pinky to the number of persons standing behind her in the queue is 3 : 5. If the total number of persons in the queue is less than 300, then the maximum possible number of persons standing ahead of Pinky is:

Q. 2. The largest real value of a for which the equation $|x + a| + |x - 1| = 2$ has an infinite number of solutions of x is:
1. 2
2. −1
3. 0
4. 1

Q. 3. The average of three integers is 13. When a natural number n is included, the average of these four integers remains an odd integer. The minimum possible value of n is:
1. 5
2. 1
3. 3
4. 4

Q. 4. Let A be the largest positive integer that divides all the numbers of the form $3^k + 4^k + 5^k$, and B be the largest positive integer that divides all the numbers of the form $4^k + 3(4^k) + 4^{k+2}$, where k is any positive integer. Then $(A + B)$ equals:

Q. 5. In a village, the ratio of number of males to females is 5 : 4. The ratio of number of literate males to literate females is 2 : 3. The ratio of the number of illiterate males to illiterate females is 4 : 3. If 3600 males in the village are literate, then the total number of females in the village is:

Q. 6. Let ABCD be a parallelogram such that the coordinates of its three vertices A, B, C are (1, 1), (3, 4) and (–2, 8), respectively. Then, the coordinates of the vertex D are:
1. (–4, 5)
2. (–3, 4)
3. (0, 11)
4. (4, 5)

Q. 7. Alex invested his savings in two parts. The simple interest earned on the first part at 15% per annum for 4 years is the same as the simple interest earned on the second part at 12% per annum for 3 years. Then, the percentage of his savings invested in the first part is:
1. 60%
2. 62.5%
3. 37.5%
4. 40%

Q. 8. The average weight of students in a class increases by 600 gm when some new students join the class. If the average weight of the new students is 3 kg more than the average weight of the original students, then the ratio of the number of original students to the number of new students is:
1. 1 : 2
2. 4 : 1
3. 1 : 4
4. 3 : 1

Q. 9. A mixture contains lemon juice and sugar syrup in equal proportion. If a new mixture is created by adding this mixture and sugar syrup in the ratio 1 : 3, then the ratio of lemon juice and sugar syrup in the new mixture is:
1. 1 : 7
2. 1 : 6
3. 1 : 5
4. 1 : 4

Q. 10. Amal buys 110 kg of syrup and 120 kg of juice, syrup being 20% less costly than juice, per kg. He sells 10 kg of syrup at 10% profit and 20 kg of juice at 20% profit. Mixing the remaining juice and syrup, Amal sells the mixture at ₹ 308.32 per kg and makes an overall profit of 64%. Then, Amal's cost price for the syrup, in rupees per kg, is:

Q. 11. A trapezium ABCD has side AD parallel to BC, ∠BAD = 90°, BC = 3 cm and AD = 8 cm. If the perimeter of this trapezium is 36 cm, then its area, in sq. cm, is:

Q. 12. All the vertices of a rectangle lie on a circle of radius R. If the perimeter of the rectangle is P, then the area of the rectangle is:
1. $\dfrac{P^2}{16} - R^2$
2. $\dfrac{P^2}{8} - 2R^2$
3. $\dfrac{P^2}{2} - 2PR$
4. $\dfrac{P^2}{8} - \dfrac{R^2}{2}$

Q. 13. Let a, b, c be non-zero real numbers such that $b^2 < 4ac$, and $f(x) = ax^2 + bx + c$. If the set S consists of all integers m such that $f(m) < 0$, then the set S must necessarily be:
1. either the empty set or the set of all integers
2. the set of all integers
3. the set of all positive integers
4. the empty set

Q. 14. Let a and b be natural numbers. If $a^2 + ab + a = 14$ and $b^2 + ab + b = 28$, then $(2a + b)$ equals:

1. 8
2. 9
3. 7
4. 10

Q. 15. In a class of 100 students, 73 like coffee, 80 like tea and 52 like lemonade. It may be possible that some students do not like any of these three drinks. Then, the difference between the maximum and minimum possible number of students who like all the three drinks is:

1. 48
2. 52
3. 53
4. 47

Q. 16. Trains A and B start travelling at the same time towards each other with constant speeds from stations X and Y, respectively. Train A reaches station Y in 10 minutes while train B takes 9 minutes to reach station X after meeting train A. Then, the total time taken, in minutes, by train B to travel from station Y to station X is:

1. 12
2. 6
3. 15
4. 10

Q. 17. Ankita buys 4 kg cashews, 14 kg peanuts and 6 kg almonds when the cost of 7 kg cashews is the same as that of 30 kg peanuts or 9 kg almonds. She mixes all the three nuts and marks a price for the mixture in order to make a profit of ₹ 1752. She sells 4 kg of the mixture at this marked price and the remaining at a 20% discount on the marked price, thus making a total profit of ₹ 744. Then, the amount, in rupees, that she had spent in buying almonds is:

1. 2520
2. 1176
3. 1680
4. 1440

Q. 18. For natural numbers x, y, and z, if $xy + yz = 19$ and $yz + xz = 51$, then the minimum possible value of xyz is:

Q. 19. Let $0 \le a \le x \le 100$ and $f(x) = |x - a| + |x - 100| + |x - a - 50|$. Then, the maximum value of $f(x)$ becomes 100 when a is equal to:

1. 0
2. 25
3. 100
4. 50

Q. 20. For any real number x, let $[x]$ be the largest integers less than or equal to x if $\sum_{n=1}^{N} \left[\frac{1}{5} + \frac{n}{25} \right] = 25$, then N is:

Q. 21. For any natural number n, suppose the sum of the first n terms of an arithmetic progression is $(n + 2n^2)$. If the nth term of the progression is divisible by 9, then the smallest possible value of n is:

1. 8
2. 7
3. 4
4. 9

Q. 22. The number of ways of distributing 20 identical balloons among 4 children such that each child gets some balloons but no child gets an odd number of balloons is:

Answer Key

Verbal Ability and Reading Comprehension (VARC)

1. (2)	**2.** (1)	**3.** (4)	**4.** (1)	**5.** (1)	**6.** (1)	**7.** (1)	**8.** (2)	**9.** (3)	**10.** (2)
11. (4)	**12.** (3)	**13.** (4)	**14.** (4)	**15.** (2)	**16.** (2)	**17.** 2431	**18.** (4)	**19.** (1)	**20.** 3214
21. (2)	**22.** 2143	**23.** (4)	**24.** (2)						

Data Interpretation and Logical Reasoning (DILR)

1. (4)	**2.** (2)	**3.** (1)	**4.** 8	**5.** 48	**6.** (2)	**7.** (3)	**8.** (4)	**9.** (2)	**10.** (1)
11. 2	**12.** (2)	**13.** (3)	**14.** (3)	**15.** (1)	**16.** 50	**17.** (2)	**18.** (4)	**19.** (4)	**20.** (4)

Quantitative Aptitude (QA)

1. 111	**2.** (4)	**3.** (1)	**4.** 82	**5.** 43200	**6.** (1)	**7.** (3)	**8.** (2)	**9.** (1)	**10.** 160
11. 66	**12.** (2)	**13.** (1)	**14.** (1)	**15.** (4)	**16.** (3)	**17.** (3)	**18.** 34	**19.** (4)	**20.** 44
21. (2)	**22.** 84								

Answers and Explanations

Verbal Ability and Reading Comprehension (VARC)

1. Option (2) is correct.

The passage focuses on the cultural differences in the concept of the value placed on original art work and the value of a copy of the art work. According to the passage, this difference in viewpoint causes tension and misunderstanding between China and the Western country. While drawing the difference in the penultimate paragraph, the passage states that in the 17th century, excavated artworks from antiquity were treated in a different manner than the way they are treated today and were not restored in a way that was faithful to the original. Instead, there was "massive intervention" in these works, changing their appearance. The question asks us to select the option with the least likelihood of following the argument. Option (1) can be derived from the second last paragraph paragraph. Option (2) is contrary to the information given in the paragraph. The rest of the two options can't be ascertained.

2. Option (1) is correct.

The question asks about the dissimilarity between the Ise Grand Shrine and the cathedral of Freiburg Minster. Options 2, 3, and 4 are mentioned or derived from the paragraphs 2 and 3. Option (1) cannot be derived from the passage. As we know, the Freiburg Minster is continually going through restoration and is covered in scaffolding almost all year around; the same is not true about the Ise Grand Shrine.

3. Option (4) is correct.

This is again a question with close options that tests your ability to analyse and anticipate. The question asks which option is not the result of the value assigned by the western world to the original art work. Based on the passage, the value of the original is way higher in the Western world. This fact might discourage simultaneous displays of multiple copies of a painting. Hence, option (1) is ruled out. Given that there is a huge emphasis on the original work, regular employment of craftsmen who are responsible for preserving and restoring original works of art, such as examining the artwork for damage and replacing eroded or damaged elements, is a fair possibility. Hence, option (2) is ruled out. Option (3) is also possible for the same reason. Option (4) is not stated and cannot be inferred from the passage. Though the passage hints that the west's attitude towards the original has altered its attitude towards cloning, nothing is explicit.

4. Option (1) is correct.

The question asks to choose the option that is unlikely to be considered as having less value than the original work by the Chinese museum, which means you have to look for the option that is of similar or higher value. From the first paragraph of the passage, it is clear that an exact reproduction of the original is considered to be of equal value to the original for the Chinese. Hence, option (1) which is an exact copy of the original, will be considered to be of equal value.

5. Option (1) is correct.

The passage suggests that through meditation and the right attitude, one allows emotions to happen to oneself (it is impossible to prevent this), but one is advised to observe the emotions without necessarily acting on them. The passage says that the second act is what one does next with the emotion and that it occurs after thinking and is under one's control. Observing emotions in a distant manner, as described in the quote, Hence, options (2), (3), and (4) are implied. Option (1) is not implied because the passage nowhere talks about or even hints at an out-of-body experience.

6. **Option (1) is correct.**

From the lines "if an army general accused Marcus Aurelius of treason in front of other officers," option (1) can be derived. The other options are neither hinted at nor mentioned in the passage. Option (2) is ruled out because the passage simply states that Marcus's second movement in the given situation could be to plot revenge. But nothing as such happened; it is merely a hypothesis. Option (3) is eliminated because the passage merely describes the immediate feeling and other reactions that may have occurred in response to the stimulus of the accusation against Marcus. It makes no mention of Marcus Aurelius' reaction to the accusation. Option (4) is also ruled out because the author only uses Marcus as an example of what might have happened in a specific situation. He does not represent Marcus as a stoic.

7. **Option (1) is correct.**

The question asks us to select the option that, if false, would contradict the facts/arguments given in the passage which means the information, if not false, would be supported by the passage. Option (1) is supported by the passage. Refer to the lines: The Epicureans, first associated with the Greek philosopher Epicurus... held a similar view, believing that people should enjoy simple pleasures, such as good conversation, friendship, food, and wine, but not be indulgent in these pursuits and not follow passion for those things that hold no real value, like power and money. If option (1) is considered false, it would contradict the information stated in the passage. Hence, it is the correct answer. Option (2) states that despite any effort, emotions cannot be controlled. If this is considered to be false, the statement would be: by practising meditation and cultivating a right attitude, emotions can be controlled. This is supported by the passage. So, option (2) is ruled out. Option (3) if falsified, is supported by the passage. As per the passage, stoicism was founded by Zeno and survived into the Roman era until about 300 AD. Nothing is mentioned about the survival of Zeno.

8. **Option (2) is correct.**

From the last two lines of the passage, option (2) can be easily deduced. The passage states that Epicureans believed in enjoying simple pleasures without being indulgent or pursuing things with no real value. This makes option (1) incorrect. Also passage states that the stoics believed in freeing themselves of nearly all desires, including excessive desires for money, power, and sexual gratification. This makes option (4) incorrect. Option (3) is not mentioned in the passage.

9. **Option (3) is correct.**

The statement suggests that mankind in its earliest years believed in the existence of the eerie creatures, which are neither alive nor dead. This expression is aptly captured in Option (3). Hence, answer (3) is the correct one. Option (4) and option (2) distort the meaning of the given sentence. Hence, they are eliminated. There is no mention of comprehending the eerie creatures' lives in the passage. Hence, option (1) is ruled out.

10. **Option (2) is correct.**

The question asks you to choose the option that, if false, would not be in accordance with the information given in the passage. The passage implies that as mankind progressed, the concept of the undead evolved and began taking more definite forms. If we falsify option (1), it will be read as follows: Humans, despite their increasing sophistication, continued to believe in the undead. This is true as per the passage. Hence, option (1) is ruled out. Option (2), if falsified, will be read as follows: The transition from the Middle Ages to the Age of Enlightenment did not see new theories of the undead. This is contrary to the information given in the passage. The last paragraph of the passage makes it clear that from the Middle Ages into the Age of Enlightenment, theories of the undead continued to grow and develop.

11. **Option (4) is correct.**

The passage does not aim to tell how the undead and the shamans became associated. The point is not to highlight humanity's failure to comprehend the full scope of the undead. Hence, options (1) and (2) are ruled out. Option (3) is too vague to select because it leaves out the key idea (the undead). The passage starts with the perception of the earliest mankind about the undead and goes on to explain the change in this perception along with the growth of mankind in various ages. Among all

the options, only option (4) encompasses the essence of the passage.

12. **Option (3) is correct.**

According to the passage, humans conceptualised the undead's abnormal status by asserting that the undead possess abnormal features such as the ability to change form and be controlled from a distance. Option (1), Option (2), and Option (4) are distorted options. Hence, they can be eliminated easily.

13. **Option (4) is correct.**

Refer to the following lines: "the problems of command over a disempowered and deskilled labor force; but everywhere [that] masses are organized - whether it be Foucault's prisons or Habermas's public sphere - the same pattern prevails." From this line, we can infer that the same pattern prevails wherever masses are organized. It does not imply that they are organised in the manner established by Foucault's prisons and Habermas' public sphere. Option (4) distorts the information given in the passage and contradicts the information given in the passage. Hence, (4) is the answer. From the same line, option (1) is correct as per the passage. From the second paragraph, line 1, option (2) can be deduced. And from the second paragraph, option (3) can be inferred easily. Hence, options (1), (2), and (3) are ruled out.

14. **Option (4) is correct.**

According to the following lines: "critical theory of technology views technologies as an environment rather than a collection of tools," and "technologies shape their inhabitants. "It can be inferred that technology influences human society. There is nothing mentioned about nature's role in shaping society. Hence, options (1) and (2) are eliminated. The passage states that law and customs represent certain aspects of human nature rather than human culture. Hence, option (3) is also ruled out.

15. **Option (2) is correct.**

The fourth paragraph explains how technology shapes human lives. It says technology is comparable to law and customs. And it represents the interests of those who use it to shape socially sanctioned dimensions of human nature. Hence, option (2) is the correct answer.

Option (1) is incorrect as it does not encompass the crux of the fourth paragraph. Automobiles are mentioned just as an example. Option (3) is partly correct, but the latter half of this option is incorrect. Option (4) is also incorrect because it distorts the facts of the fourth paragraph.

16. **Option (2) is correct.**

Option (1) is derived from the lines: "a hermeneutics of technology must make explicit the meanings implicit in the devices we use and the rituals they script," and that "social histories of technologies such as the bicycle, artificial lightning, or firearms have made important contributions to this type of analysis." Option (3) can be derived from the lines: "critical theory of technology is a political theory of modernity with a normative dimension," and that it belongs to a tradition "according to which advances in the formal claims of human rights take centre stage while in the background the centralization of ever more powerful public institutions and private organisations imposes an authoritarian social order." The passage states, "laws of property represent the interest in ownership and control." Customs such as parental authority represent the interest of childhood in safety and growth." It further mentions that "interests such as these constitute the version of human nature sanctioned by society." This means the concept of human nature is not fixed but is shaped by society and emerges, from the historical context. From this, option (4) can be derived. The only option that can't be inferred is option (2), since the passage doesn't mention anything about the negative impact of technology.

17. **Correct answer is [2431].**

The paragraph is about collagen and its medical use. Statement (2) is an obvious opener because it introduces the topic of the paragraph. Statement (4) continues the idea by highlighting the risks associated with the medical use of collagen from other species. Statement (3) carries forward the idea by mentioning that fish skin collagen has less possibility of catching infection, and by explaining its reason, the statement asserts that fish skin is an excellent collagen for medical usage. Hence, the correct sequence is 2431.

18. **Option (4) is correct.**

    The passage is about our understanding of the distinction between animate and inanimate objects. The passage asserts that our understanding of the distinction between animate and inanimate is not as complete as we believe, especially when we try to understand it from the perspective of quantum physics. This is aptly summed up in option (4). Hence, (4) is the correct answer. The passage nowhere states that the effect of stimuli is similar in inanimate objects compared to living beings or mentions astigmatism or an erroneous view of reality, nor does the passage suggest that inanimates are cognizant. Hence, options (1), (2), and (3) are ruled out.

19. **Option (1) is correct.**

    The passage discusses Ethiopia's historical connections to Europe throughout the Middle Ages. Ethiopia has been characterised in the historical accounts of this relationship as being helpless and in need of European military support. However, recent research has shown that this narrative is untrue and that Ethiopia was actually a well-connected and outward-looking culture that engaged in missions of diplomacy, faith, and commerce with Europe. The paragraph also mentions how these recent discoveries force historians to reconsider the linkages between Ethiopia and Europe during this time period and to take into account Ethiopia's participation as a more active player. The primary arguments in the passage [that the conventional story of Ethiopia's relationship with Europe is false] are well reflected in Option (1). Hence, option (1) is correct.

    It is not stated in the sentence that Ethiopia's relationship with Europe was misunderstood by historians. Thus, Option (2) is incorrect. The discussion does not make sense in light of Option (3) contention that mediaeval writings were biased against Africa and in favour of Europe. The same is true for option (4), it is inaccurate because it implies, contrary to what is mentioned in the passage, that the relationships between Ethiopia and Europe were largely of a military and commercial nature.

20. **Correct answer is [3214].**

    The paragraph starts with sentence (3) because it introduces the subject of the passage—the creative industry. The addition of 'in fact' in statement (2) strengthens the argument raised in (1). Hence, (2) will follow (3). Sentence (4) talks about the reason mentioned in sentence (1), this is emphasized with the use of 'It is for this reason'. Hence, 1 and 4 will make a pair. So, the sequence will be 3214.

21. **Option (2) is correct.**

    The paragraph explores the function of petitions in democratic administration. It emphasises how petitions can influence political agendas, mobilise supporters for causes, provide voice to those who cannot vote, and employ rhetorical argument to make ideas clearer. The section also makes a comparison between petitioning and elections, noting that petitioning is a replacement to elections and allows for continual communication with the government. Instead of speculating on the relative merits of petitioning vs elections, the author focuses on the unique ways in which petitioning might support democratic operation. This is aptly summed up in option (2). Hence, option (2) is the correct answer.

    The passage does not assert that petitioning is "an ideal form of representative democracy." It just states that it can offer voice to those who can't vote and that it can be used to apply the discipline of rhetorical argument. It does not assert that petitioning is more effective than other forms of democracy. Hence, option (1) is incorrect.

    Option (3) is ruled out because the passage makes no mention of petitions being a more effective means of representing the voice of the people than elections. It does not compare elections to petitioning in this sense; it merely states that petitioning can offer voice to those who cannot vote. The passage merely notes that petitioning has historically been crucial to democratic functioning and that it supplements the electoral process by allowing ongoing engagement with the government. It does not imply, however, that the operation of democratic government would necessarily improve if we relied more on petitioning than on holding regular elections.

    Option (4) is also incorrect because the sentence does not imply that citizens are becoming less likely to petition.

22. Correct answer is [2143].

The paragraph is about the benefits of a shorter commute. Statements 1 and 4 make a pair because both sentences talk about company leaders' consideration of saving the time of commuting for their staff in efforts to increase productivity. Since statement 4 discusses the work-from-home option, it will be followed by sentence 3, which talks discusses another side of the coin of work-from-home option, emphasized with the use of 'This' in (3). Thus, the sequence will be 2143.

23. Option (4) is correct.

The paragraph is exploring the impact of exposure to online resources on the studies and knowledge of the current generation. There is no scope for inserting the given sentence in the blanks (1), (2), and (3) because the sentences are in the same flow of ideas. The given answer sentence is a concluding sentence, which says the internet is both a bane and a boon for the citizens. So ideally, after this sentence, the author will write about the banes and boons of the internet. Hence, the given sentence is befitting of the last blank, the blank (4).

24. Option (2) is correct.

Sentences 1 and 2 are in continuity because 1 says "the temptation would be to go all out" and 2 contradicts it by saying "but people are opting for a secret ceremony." So, the given sentence can't fit in the 1st blank. Sentence (3) explains the reason behind people's opting for a secret ceremony. The next sentence uses "plus" and adds to the justification of this phenomenon of people opting for the secret ceremony. To make a coherent paragraph, there should be a sentence preceding this one that justifies the secret ceremony. Hence, the blank should be supplied with a given sentence.

Data Interpretation and Logical Reasoning (DILR)

Solution for Questions 1 to 5:
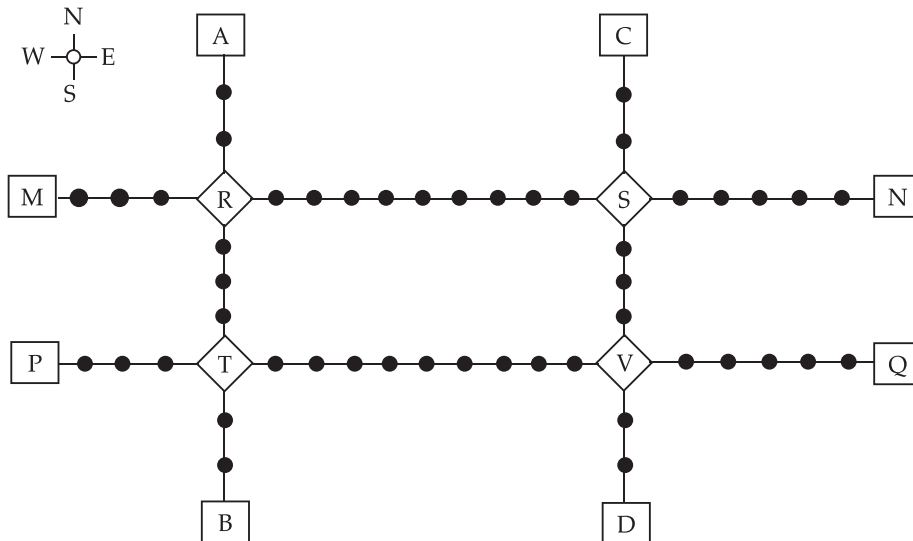
1. **Option (4) is correct.**

   Total number of stations between M and N = 17

   Total junction stations = 2

   As given in the question that train stop for 2 minutes at each of the junction stations on the way and for 1 minute at each of the other stations.

   So, total stop time = $17 \times 1 + 2 \times 2 = 21$ min

   Also given that, It takes 2 minutes to reach the next station for trains going in east-west direction.

   So, Total running time = $20 \times 2 = 40$ min

   Total time required to reach station N from M = $21 + 40 = 61$ min during the service hours, there are metro service every 10 minutes in the east-west lines.

   So, Hari will catch the train at 8:10 am.

   Time when Hari will reach at station N = 8:10 am + 61 min = 9:11 am

2. **Option (2) is correct.**

   Shortest path will be B-T-R-S.

   Time taken from station B to T = 9 + 2 = 11 min.

   So, Train will reach at T = 10:15 am + 11 min = 10:26 am and will depart at 10.28 am.

   Now, time taken to reach station R from T = $4 \times 3 + 3 = 15$ min

   So, Time when Priya will be at station R = 10:28 am + 15 min = 10:43 am

   Now, she can catch the train which is coming from station M at 10:30 towards R. The train will reach at station R at 10:41 am and will depart at 10:43 am.

   Time taken to reach at station S from station R = 20 + 9 = 29 min

   So, time when she reaches at station R = 10:43 am + 29 min = 11:12 am

3. **Option (1) is correct.**

   Travelling time between S and R = $(10 \times 2) + (9 \times 1) = 29$ min

   After 2 min stoppage at R,

   Total time to reach at station B = $(7 \times 3) + (1 \times 2) + (5 \times 1) = 28$ min

   Every 15 minutes, a train starts from A in the north-south direction. The last train that leaves A will be at 12:00 am and it will leave R at 12:13 am, so Haripriya must reach R till 12:13 am.

   Travelling time between S and R = $(10 \times 2) + (9 \times 1) = 29$ min

   So, Haripriya must board the train at S by 11:44 pm.

   In the east-west direction, the first train from N arrives at S at time = 6 am + $(6 \times 2) + (5 \times 1)$ = 6:17 am

   Since, S is a junction so this train will halt for 2 minutes at S and leave at 6:19.

   Every 10 minutes, a train starts from N in the east-west direction.

Therefore, Haripriya should board the train which leaves S at 11:39.

4. **Correct answer is [8].**

The frequency of trains either from station A or station B is 15 minutes after 6 am.

As there are 7 stations, 2 junctions and 10 travelling paths.

Total time taken by a north-south train $= 10 \times 3 + 2 \times 2 + 7 \times 1 = 41$ min

The train which starts from A at 6 am will reaches at B at 6:41 am. It needs to rest for 15 minutes before it can start the journey back to A that is, it can start it's journey at 6:56 or after that.

As per schedule, north-south trains leave after every 15 minutes starting from 6 am. Hence, the train that starts from A to B at 6 am, can start its backward journey at 7 am.

Because station B have to be trains starting at 6 am, 6:15 am, 6:30 am and 6:45 am before trains coming from A can start their journey back.

Hence, we need at least four trains from B to A and similarly from A to B.

∴ We need at least eight trains on the route AB.

5. **Correct answer is [48].**

From question number, we already calculated that at least 8 trains are required at north-south track either for AB or CD. So total 16 trains are required to cover both north-south track.

Total time taken by an east-west train = 61 min (already calculated in first question)

A train going from M to N at 6 am will reach N at 7:01 and will be ready for journey back at 7:16 am. A train starts from N every 10 min. Hence, this train can start its journey at 7:20 am.

So, there have to be trains starting at 6 am, 6:10 am, 6:20 am, 6:30 am, 6:40 am, 6:50 am, 7 am and 7:10 am before trains coming from M can start their journey back.

Hence, we need at least eight trains from N to M and similarly eight from M to N.

∴ We need at least 16 trains on either route MN or at route PQ

So, total 32 trains are required to cover both routes in east-west direction.

So, we need at least 16 + 32 = 48 trains.

Solution for Questions 6 to 10:

It is given that,

Number of goals scored by four players = 12.

All goals are in such a way that each player scored at least one goal and distinct number of total goals.

So, possible scores by them are 1, 2, 3, 6 or 1, 2, 4, 5.

From statement 1, Only one goal was scored in every even numbered match.

From statement 5, An equal number of goals were scored in Match 3 and Match 7, which was different from the number of goals scored in either Match 1 or Match 5.

Let the number of goals scored in Match 3 and 7 be x each.

	Amla	Bimla	Harita	Sarita	Total
Match 1					$a \neq x$
Match 2					1
Match 3					x
Match 4					1
Match 5					$b \neq x$
Match 6					1
Match 7					x
Match 8					1

As given in statement 6, The match in which the highest number of goals was scored was unique and it was not Match 5.

So, Highest goals were scored in Match 1.

	Amla	Bimla	Harita	Sarita	Total
Match 1					$a \neq x$ (highest)
Match 2					1
Match 3					x
Match 4					1
Match 5					$b \neq x$
Match 6					1
Match 7					x
Match 8					1

As given in statement 4, Bimla scored a goal in Match 1 and one each in three other consecutive matches. And from statement 2, Harita scored more goals than Bimla.

So, Bimla scored at least four goals while Harita scored at least five goals.

$\therefore 12 = 1 + 2 + 4 + 5$

So, Bimla scored four goals while Harita scored at five goals.

	Amla	Bimla	Harita	Sarita	Total
Match 1		1			$a \neq x$ (highest)
Match 2					1
Match 3					x
Match 4					1
Match 5					$b \neq x$
Match 6					1
Match 7					x
Match 8					1
	1/2	4	5	2/1	

As given in statement 3, The highest goal scorer scored goals in exactly 3 matches including Match 4 and Match 8.

$\therefore$ Harita can score maximum one goal each in Match 4 and 8, hence she scores three goals in one more Match. The only match Harita can score three goals is Match 1, since highest numbers of goals are scored in Match 1.

	Amla	Bimla	Harita	Sarita	Total
Match 1		1	3		$a \neq x$ (highest)
Match 2			✗		1
Match 3			✗		x
Match 4	✗	✗	1	✗	1
Match 5			✗		$b \neq x$
Match 6			✗		1
Match 7			✗		x
Match 8	✗	✗	1	✗	1
	1/2	4	5	2/1	

From statement 4, Bimla scored a goal in Match 1 and one each in three other consecutive matches.

So, Three consecutive matches Bimla can score in are Match 5, 6 and 7.

	Amla	**Bimla**	**Harita**	**Sarita**	**Total**
Match 1		1	3		$a \neq x$ (highest)
Match 2		✗	✗		1
Match 3		✗	✗		x
Match 4	✗	✗	1	✗	1
Match 5		1	✗		$b \neq x$
Match 6	✗	1	✗	✗	1
Match 7		1	✗		x
Match 8	✗	✗	1	✗	1
	1/2	4	5	2/1	

Now, $a + 1 + x + 1 + b + 1 + x + 1 = 12$

$\Rightarrow a + b + 2x = 8$

[Match 7: x has to be greater than or equal to 1.]

Case 1: $x = 1 \Rightarrow a + b = 6 \Rightarrow$

$a = 4$ and $b = 2$ [a has to be uniquely highest and $a, b \neq x$]

Case 2: $x = 2$

$\Rightarrow a + b = 4$ Rejected as minimum value of a is 4 and that of b is 1.

$\therefore$ $x = 1, a = 4$ and $b = 2$

	Amla	**Bimla**	**Harita**	**Sarita**	**Total**
Match 1	✗	1	3	✗	4
Match 2		✗	✗		1
Match 3		✗	✗		1
Match 4	✗	✗	1	✗	1
Match 5		1	✗		2
Match 6	✗	1	✗	✗	1
Match 7	✗	1	✗	✗	1
Match 8	✗	✗	1	✗	1
	1/2	4	5	2/1	

6. **Option (2) is correct.**
   Amla or Sarita could have scored one or two goal/s in any order.
   Number of goals scored in Match 7 = 1.

7. **Option (3) is correct.**
   Goal scored in Match 1, 3, 5 and 7 are 4, 1, 2 and 1 respectively.

8. **Option (4) is correct.**
   Statement - 1 – true
   Statement - 2 – true

$\therefore$ Both statements are true.

9. **Option (2) is correct.**
   Statement - 1 – true
   Statement - 2 – true
   $\therefore$ None statements are false.

10. **Option (1) is correct.**
    Statement - 1 – false
    Statement - 2 – not necessarily true
    $\therefore$ None of the statements is necessarily true

Solution for Questions 11 to 15:

Funds received by them, in descending order, were ₹390,000, ₹210,000, ₹165,000, ₹77,000, and ₹66,000.

So, the product of tokens will be 390, 210, 165, 77, 66.

So, break of tokens received

$$390 = 2 \times 3 \times 5 \times 13$$
$$210 = 2 \times 3 \times 5 \times 7$$
$$165 = 3 \times 5 \times 11$$
$$77 = 7 \times 11$$
$$66 = 2 \times 3 \times 11$$

As given in statement 1, Fatima awarded tokens to everyone except Qahira.

So, Fatima must have awarded token number 3 to everyone and Qahira received tokens whose product is 77.

It is also given in statement 1 that Adhara awarded tokens to no one except Pragnyaa.

So, Adhara must have awared token 13 and Pragnyaa received tokens whose product is 390.

Interviewers		Fatima				Adhara	Product of token
Token	2	3	5	7	11	13	
Pragnyaa	✔	✔	✔	✗	✗	✔	390
Qahira	✗	✗	✗	✔	✔	✗	77
Rasheeda		✔					
Smera		✔					
Tantra		✔					

As given in statement 2, Rasheeda received the highest number of tokens that anyone received, but she did not receive one from Esther.

So, Rasheeda must have received 4 tokens whose product can only be 210. Also, since Esther did not give her the token, hence Esther must have distributed token number 11.

Interviewers		Fatima			Esther	Adhara	Product of token
Token	2	3	5	7	11	13	
Pragnyaa	✔	✔	✔	✗	✗	✔	390
Qahira	✗	✗	✗	✔	✔	✗	77
Rasheeda	✔	✔	✔	✔	✗	✗	210
Smera		✔					
Tantra		✔					

As given in statement 3, Dhanavi awarded a token to Qahira but not to Smera.

∴ Dhanavi must have awarded token number 7.

Interviewers		Fatima		Dhanavi	Esther	Adhara	Product of token
Token	2	3	5	7	11	13	
Pragnyaa	✔	✔	✔	✗	✗	✔	390
Qahira	✗	✗	✗	✔	✔	✗	77
Rasheeda	✔	✔	✔	✔	✗	✗	210
Smera		✔				✗	
Tantra		✔				✗	

Also given in statement 3, Bithi awarded a token to Smera but not to Qahira

∴ Bithi/Chhaya could have awarded token 2/5 in any order.

Interviewers	B/C	Fatima	C/B	Dhanavi	Esther	Adhara	Product of token
Token	2	3	5	7	11	13	
Pragnyaa	✔	✔	✔	✗	✗	✔	390
Qahira	✗	✗	✗	✔	✔	✗	77
Rasheeda	✔	✔	✔	✔	✗	✗	210
Smera		✔		✗	✔	✗	165/66
Tantra		✔		✗	✔	✗	66/165

11. **Correct answer is [2].**

    If Bithi gives token number 2 to S/T, then Chhaya will be given token number 5 to T/S and vice-versa.

    So, Qahira received two tokens i.e., 7 and 11.

12. **Option (2) is correct.**

    In any of the cases, Pragnyaa definitely received a token from Bithi but not from Dhanavi.

13. **Option (3) is correct.**

    In any of the cases, Chhaya will definitely distribute three tokens. i.e., to (Pragnyaa, Rasheeda and Smera) or to (Pragnyaa, Rasheeda and Tantra)

14. **Option (3) is correct.**

    In any of the cases, Smera will definitely receive three tokens. i.e., (2, 3 and 11) or (3, 5 and 11).

15. **Option (1) is correct.**

    Tantra could receive either (2, 3 and 11) tokens or (3, 5 and 11) tokens that is Tantra's funds can either be ₹66,000 or ₹165,000.

Solution for Questions 16 to 20:

It is given that, out of six singers from given class, four are boys.

So, remaining two are female singers

From 10 dancers in the class, four are girls. No dancer in the class is a singer.

So, There are six male dancers and four female dancers.

	Girls (15)				Boys (10 + x)			
	D(4)	S(2)	N(9)	Total(15)	D(6)	S(4)	N(x)	Total(10 + x)
1-Day								
2-Days								
3-Days								

From statement 4, No girl is interested in attending a 3-day event. All male singers and two, of the dancers are interested in attending a 3-day event.

As there are total four male singers and all of them are interested in a 3-day event, they all must also be interested in a 2-day and a 1-day event.

As two male dancers are interested three-day event. So, male dancers interested in 2-day event must be more than or equal to two.

	Girls (15)				Boys (10 + x)			
	D(4)	S(2)	N(9)	Total(15)	D(6)	S(4)	N(x)	Total (10 + x)
1-Day						4		
2-Days					2 + b	4		
3-Days	0	0	0	0	2	4		

From statement 1, All the girls and 80% of the boys are interested in attending a 1-day event. 60% of the boys are interested in attending a 2-day event.

From statement 3, 70% of the boys who are interested in attending a 2-day event are neither singers nor dancers.

Hence, 30% of those who are interested in a 2-day event are dancers or singers.

	Girls (15)				Boys (10 + x)			
	D(4)	S(2)	N(9)	Total(15)	D(6)	S(4)	N(x)	Total (10 + x)
1-Day	4	2	9	15		4		80% of (10 + x)
2-Days					2 + b	4		60% of (10 + x)
3-Days	0	0	0	0	2	4		

Now, $b + 2 + 4 = $ 30% of 60% of (10 + x)

$$\Rightarrow b + 6 = \frac{30}{100} \times \frac{60}{100} \times (10 + x) \qquad\qquad \Rightarrow 6 + b = \frac{9}{50} \times (10 + x)$$

Here, b has to be an integer, hence (10 + x) should be completely divisible by 50.

$\therefore$ x should be 40 or 90 or 140 and so on. But since b cannot be greater than 4, x should be 40 and $b = 3$.

	Girls (15)				Boys (50)			
	D(4)	S(2)	N(9)	Total(15)	D(6)	S(4)	N(40)	Total (50)
1-Day	4	2	9	15		4		40
2-Days					5	4	21	30
3-Days	0	0	0	0	2	4		

From statement 5, The number of singers interested in attending a 2-day event is one more than the number of dancers interested in attending a 2-day event.

This is only possible when two female singers while no female dancer is interested in a 2-day event.

	Girls (15)				Boys (50)			
	D(4)	S(2)	N(9)	Total(15)	D(6)	S(4)	N(40)	Total (50)
1-Day	4	2	9	15		4		40
2-Days	0	2			5	4	21	30
3-Days	0	0	0	0	2	4		

From statement 3, 60% of the girls who are interested in attending a 2-day event are neither singers nor dancers.

$$\Rightarrow 0 + 2 = \frac{2}{5} \times (0 + 2 + \text{females interested in a 2-day event who are neither singer nor dancer})$$

So, females interested in a 2-day event who are neither singer nor dancer = 3

	Girls (15)				Boys (50)			
	D(4)	S(2)	N(9)	Total(15)	D(6)	S(4)	N(40)	Total (50)
1-Day	4	2	9	15		4		40
2-Days	0	2	3	5	5	4	21	30
3-Days	0	0	0	0	2	4		

16. **Correct answer is [50].**

    There are 50 boys in the class.

17. **Option (2) is correct.**

    Statement 1 cannot be determined.

    Statement 2- The number of female dancers who are interested in attending a 1-day event = 4

    Hence only statement 2 can be determined.

18. **Option (4) is correct.**

    Total students in the class = 15 + 50 = 65

Total students interested in two-day event
= 5 + 30 = 35
$\therefore$ Required fraction = 35/65 = 7/13

19. **Option (4) is correct.**

    Number of male dancers who are interested in attending 1-day event has to be more than or equal to number of male dancers who are interested in attending a 2-day event that is, 5 or 6.

20. **Option (4) is correct.**

    Female dancers are interested in attending a 2-day event = 0.

Quantitative Aptitude (QA)

1. Correct answer is [111].

Let ratio be x

Number of persons standing ahead $= 3x$

and number of persons standing behind $= 5x$

A.T.Q,

$$3x + 5x + 1 < 300$$

$$\Rightarrow \qquad x < 37.3$$

Maximum value of x is 37.

∴ Maximum number of persons standing ahead $= 3 \times 37 = 111$

2. Option (4) is correct.

Given equation has an infinite number of solution for any value of x. This is possible when x is cancels out in given equation.

Case 1: $x + a < 0$ and $x - 1 \geq 0$

$-a - x + x - 1 = 2 \Rightarrow a = -3$

Case 2: $x + a \geq 0$ and $x - 1 < 0$

$x + a - x + 1 = 2 \Rightarrow a = 1$

∴ Largest value of a is 1.

3. Option (1) is correct.

Sum of three integers $= 3 \times 13 = 39$

Let average of four integers is odd integer k

∴ Sum of four integers $= 4k$

∴ $n = 4k - 39 > 0$

$\Rightarrow k > 9.7$

∴ $k = 11$

∴ $n = 44 - 39 = 5$

4. Correct answer is [82].

Put $k = 1 : 3^1 + 4^1 + 5^1 = 12$

Put $k = 2 : 3^2 + 4^2 + 5^2 = 50$

Put $k = 3 : 3^3 + 4^3 + 5^3 = 216$

H.C.F of 12, 50 and 216 is 2

∴ $\qquad A = 2$

Now, $4^k + 3(4^k) + 4^{k+2}$

$\qquad = 4^k + 3.4^k + 4^k.4^2$

$\qquad = 4^k (1 + 3 + 16)$

$\qquad = 4^k.20$

∴ $\qquad B =$ H.C.F of $4^k \times 20 = 4 \times 20 = 80$

So, $A + B = 2 + 80 = 82$

5. Correct answer is [43200].

Given that the ratio of number of literate males to literate females is 2 : 3 and number of literate males is 3600.

∴ Number of literate females $= 3600 \times \dfrac{3}{2}$

$\qquad\qquad\qquad\qquad = 5400$

Since, ratio of males and females is 5 : 4

∴ Let males and females are $5x$ and $4x$

∴ Number of illiterate males $= 5x - 3600$

Number of illiterate females $= 4x - 5400$

A.T.Q

$$\frac{5x - 3600}{4x - 5400} = \frac{4}{3}$$

$\Rightarrow \qquad 15x - 10800 = 16x - 21600$

$\Rightarrow \qquad\qquad\qquad x = 10800$

∴ Number of females $= 4 \times 10800 = 43200$

6. Option (1) is correct.

Let coordinate of D is (x, y).

Since, diagonals of parallelogram bisect each other.

Mid point of AC = mid point of BD

$$\left(\frac{1-2}{2}, \frac{1+8}{2} \right) = \left(\frac{3+x}{2}, \frac{4+y}{2} \right)$$

$\Rightarrow \qquad\qquad \dfrac{1-2}{2} = \dfrac{3+x}{2} \Rightarrow x = -4$

and $\qquad\qquad \dfrac{1+8}{2} = \dfrac{4+y}{2} \Rightarrow y = 5$

∴ D is $(-4, 5)$.

7. Option (3) is correct.

Let Alen invested his saving in two parts by x and y.

A.T.Q

$$\frac{x \times 15 \times 4}{100} = \frac{y \times 12 \times 3}{100} \Rightarrow \frac{x}{y} = \frac{3}{5}$$

∴ Percentage of his saving invested in the first part $= \dfrac{x}{x+y} \times 100 = \dfrac{3}{3+5} \times 100$

$\qquad\qquad\qquad\qquad = 37.5\%$

8. Option (2) is correct.

Let original number of students be n_1 and where average weight is x and n_2 new students increase in class whose average weight is $x + 3$.

∴ Combined average

$\Rightarrow \dfrac{n_1 x + n_2 (x+3)}{n_1 + n_2} = x + 0.6$

$\Rightarrow n_1 x + n_2 x + 3n_2 = n_1 x + n_2 x + 0.6\, n_1 + 0.6\, n_2$

$\Rightarrow \qquad 2.4\, n_2 = 0.6\, n_1$

∴ $\qquad\qquad \dfrac{n_1}{n_2} = \dfrac{2.4}{0.6} = \dfrac{4}{1}$

9. **Option (1) is correct.**

Let old mixture be x and new sugar syrup is $3x$

$\therefore$ Lemon juice in old mixture $= \dfrac{x}{2}$

Sugar syrup in old mixture $= \dfrac{x}{2}$

$\therefore$ Total sugar syrup $= \dfrac{x}{2} + 3x = \dfrac{7x}{2}$

Ratio of lemon juice and sugar syrup

$= \dfrac{x/2}{7x/2} = \dfrac{1}{7} = 1:7$

10. **Correct answer is [160].**

Let C.P. of juice be ₹ x per kg.

C.P. of syrup be ₹ $0.8\,x$ per kg.

S.P. of 10 kg syrup $= 8x \times \dfrac{110}{100} = 8.8x$

S.P. of 20 kg juice $= 20x \times \dfrac{120}{100} = 24x$

S.P. of remaining juice and syrup (100 + 100) kg

$= 200 \times 308.32 = 61664$

A.T.Q

$8.8x + 24x + 61664 = \dfrac{164}{100}(88x + 120x)$

$32.8x + 61664 = 341.12x$

$\Rightarrow \qquad 308.32x = 61664$

$\Rightarrow \qquad\qquad x = 200$

$\therefore$ Cost price of syrup $= 0.8 \times 200$

$= $ ₹ 160 per kg.

11. **Correct answer is [66].**

In Δ DEC,
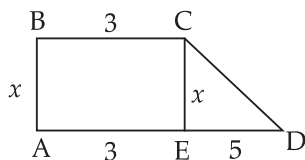
$CD = \sqrt{x^2 + 25}$

$\therefore$ Perimeter of ABCD

$\Rightarrow x + \sqrt{x^2 + 25} + 11 = 36$

$\Rightarrow \sqrt{x^2 + 25} = 25 - x$

$\Rightarrow x^2 + 25 = x^2 - 50x + 625$

$\Rightarrow x = 12$

$\therefore$ Area of trapezium $= \dfrac{1}{2}$ (sum of parallel

side) $\times h$

$= \dfrac{1}{2}(3 + 8) \times 12 \ = 66 \text{ cm}^2$

12. **Option (2) is correct.**

Perimeter of rectangle
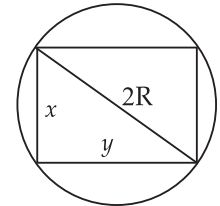
$= 2x + 2y = P$

$= x + y = P/2$

$x^2 + y^2 = 4R^2$

We have

$(x + y)^2 = x^2 + y^2 + 2xy$

$\dfrac{P^2}{4} = 4R^2 + 2xy$

$\therefore \qquad xy = \dfrac{P^2}{8} - 2R^2$

$\therefore$ Area of rectangle $= xy = \dfrac{P^2}{8} - 2R^2$

13. **Option (1) is correct.**

Given that,

$\qquad\qquad b^2 < 4ac$

$\Rightarrow b^2 - 4ac < 0$

$\therefore$ Discriminant is less than 0.

We have $f(x) > 0$ if $D < 0$ and $a > 0$

$f(x) < 0$ if $D < 0$ and $a < 0$

Given that

$f(m) < 0$ and m is an integer,

So, set containing values of m either will be empty if $a > 0$ or it will be set of all integers if $a < 0$.

14. **Option (1) is correct.**

Given,

$\qquad\qquad a^2 + ab + a = 14$

$\Rightarrow \qquad a(a + b + 1) = 14 \qquad\qquad$ ...(i)

and

$\qquad\qquad b^2 + ab + b = 28$

$\Rightarrow \qquad b(a + b + 1 = 28) \qquad\qquad$ ...(ii)

Divide equation (i) by (ii), we get

$\qquad\qquad \dfrac{a}{b} = \dfrac{1}{2} \Rightarrow b = 2a$

Putting in (i), we get

$\qquad\quad a(a + 2a + 1) = 14$

$\Rightarrow \qquad 3a^2 + a - 14 = 0$

$\Rightarrow \quad (3a + 7)(a - 2) = 0$

$\Rightarrow \qquad\qquad\qquad a = 2, \dfrac{-7}{3}$

$\therefore$ a and b are natural numbers

$\therefore$ $a = 2$ and $b = 4$

Now, $2a + b = 4 + 4 = 8$

15. Option (4) is correct.

Let a, b, c and d be the number of students who likes none of the drinks, exactly one drink, exactly 2 drinks and all three drinks, respectively.

Since, given that total students is 100

$\therefore a + b + c + d = 100$ ...(i)

and $b + 2c + 3d = 73 + 80 + 52 = 205$ ...(ii)

Subtract (i) from (ii), we get

$c + 2d - a = 105$

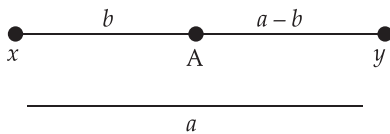Take maximum value of $d = 52$

then $c = 1$ and $a = 0$

Take minimum value of $d = 5$

then $c = 95$ and $a = 0$

$\therefore$ Difference $= 52 - 5 = 47$

16. Option (3) is correct.

Let speed of train A and B be x and y respectively.

```
        b          a − b
  ●────────────●────────────●
  x            A            y
  ──────────────────────────
              a
```

$\therefore$ A.T.Q

$$\frac{b}{x} = \frac{a - b}{y}$$ ...(i)

Given that, $\frac{a}{x} = 10 \Rightarrow x = \frac{a}{10}$

and $\frac{b}{y} = 9 \Rightarrow y = \frac{b}{9}$

$$\frac{b}{a/10} = \frac{a - b}{b/9}$$ [from (i)]

$\Rightarrow \quad \dfrac{10b}{a} = \dfrac{9a - 9b}{b}$

$\Rightarrow \quad 10b^2 = 9a^2 - 9ab$

$\Rightarrow \quad 10b^2 + 9ab - 9a^2 = 0$

On solving, we get $b = \dfrac{3a}{5}$

$\because \qquad \dfrac{b}{y} = 9 \Rightarrow \dfrac{3a}{5y} = 9$

$\Rightarrow \qquad \dfrac{a}{y} = \dfrac{9 \times 5}{3} = 15$

$\therefore$ Total time taken by B is 15 minutes.

17. Option (3) is correct.

Let C.P of 1 kg almonds is ₹ x

C.P of 1 kg cashews is ₹ $\dfrac{9x}{7}$

C.P of 1 kg peanuts is ₹ $\dfrac{9x}{30}$

$\therefore$ Total C.P $= \dfrac{36x}{7} + \dfrac{63x}{15} + 6x$

$= \dfrac{1611x}{105} = \dfrac{537x}{35}$

Let marked price of mixture is ₹ y.

A.T.Q

$$24y - 1752 = \frac{537x}{35}$$ ...(i)

And $4y + 20y \times \dfrac{80}{100} - 744 = \dfrac{537x}{35}$

$$20y - 744 = \frac{537x}{35}$$ ...(ii)

From (i) and (ii)

$24y - 1752 = 20y - 744 \Rightarrow y = 252$

Putting in (i)

$24(252) - 1752 = \dfrac{537x}{35} \Rightarrow x = 280$

$\therefore \qquad$ Cost of almonds $= 6 \times 280 = 1680$

18. Correct answer is [34].

Given that,

$xy + yz = 19$

$y(x + z) = 19$

$\therefore$ Factor of 19 is 1 and 19.

$\therefore y = 1$ and $x + z = 19 \qquad (\because x, y, z = N)$

$yz + xz = 51$

$\Rightarrow z(x + y) = 51 \Rightarrow z(x + 1) = 51$

Factor of $51 = 1, 3, 17, 51$.

Case 1: $Z = 1$ and $x + 1 = 51 \Rightarrow x = 50$

It is not possible because $x + z = 19$.

Case 2: $Z = 3$ and $x + 1 = 17 \Rightarrow x = 16$

It is possible.

Case 3: $Z = 51$ and $x + 1 = 1 \Rightarrow x = 0$

It is not possible.

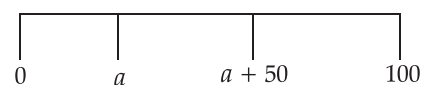**Case 4:** $Z = 17$ and $x + 1 = 3 \Rightarrow x = 2$

It is possible.

So, value of x, y and z can be 16, 1, 3 or 2, 1, 17

$\therefore xyz = 48$ or 34.

Hence, minimum value is 34.

19. Option (4) is correct.

$\because 0 \leq a \leq x \leq 100$

```
  |        |        |              |
  0        a      a + 50         100
```

$f(x) = \begin{cases} -3x + 2a + 150 & ; \quad 0 \leq x < a \\ -x + 150 & ; \quad a \leq x < a + 50 \\ x - 2a + 50 & ; \quad a + 50 \leq x \leq 100 \end{cases}$

Given that maximum value of $f(x)$ is 100.

$\therefore -x + 150 = 100 \Rightarrow x = 50$

and $-3x + 2a + 150 = 100$

$-150 + 2a + 150 = 100$

$\Rightarrow \qquad\qquad a = 50$

20. **Correct answer is [44].**

$$\sum_{n=1}^{N}\left(\frac{1}{5} + \frac{n}{25}\right) = 25$$

$$\Rightarrow \sum_{n=1}^{N}\left(\frac{5+n}{25}\right) = 25$$

$$\Rightarrow \left[\frac{5+1}{25}\right] + \left[\frac{5+2}{25}\right] + \cdots \left[\frac{5+19}{25}\right] + \left[\frac{5+20}{25}\right]$$

$$+ \cdots + \left[\frac{5+44}{25}\right] + \cdots = 25$$

$$\Rightarrow \underbrace{0 + 0 + \ldots + 0}_{19} + \underbrace{1 + 1 + \ldots + 1}_{25} = 25$$

$\therefore$ N $= 19 + 25 = 44$

21. **Option (2) is correct.**

Given that,

$S_n = n + 2n^2$

$S_1 = 1 + 2 = 3$

$S_2 = 2 + 8 = 10$

$\therefore \quad a = 3 \; a_2 = S_2 - S_1 = 10 - 3 = 7$

$d = 7 - 3 = 4$

$a_n = 3 + (n-1)4 = 4n - 1$

Put $n = 1, 2, 3, 4, 5, 6, 7 \ldots$, we get minimum value of n is 7 for a_n divisible by 9.

22. **Correct answer is [84].**

Since each child gets even number of balloons.

Let the number of balloons each child received be $2a$, $2b$, $2c$ and $2d$

$\therefore 2a + 2b + 2c + 2d = 20$

$a + b + c + d = 10$

Since, each child gets some balloons

$\therefore$ Total number of ways $= {}^{n-1}C_{r-1}$

$= {}^{10-1}C_{4-1} = {}^{9}C_{3} = 84$.