CAT 2022 Slot 3 Question Paper

Conducted by the Indian Institute of Management Bangalore (IIM Bangalore)

Time Allowed: 2 Hours | **66 Questions** | **Maximum Marks: 198**

General Instructions

(i) This paper contains **66 questions** from **CAT 2022 Slot 3**, held on **27 November 2022**. The original examination was a **computer-based test** with a **120-minute** duration.

(ii) The question groups appear in their original sequence: **Verbal Ability and Reading Comprehension** (24 questions); **Data Interpretation and Logical Reasoning** (20 questions); **Quantitative Ability** (22 questions).

(iii) Each section is timed separately: **40 minutes per section**. A candidate cannot switch between sections during the test.

(iv) The paper has **multiple choice questions (MCQs)**, each with four options and one correct answer, and **Type In The Answer (TITA)** questions.

(v) **Marking scheme: +3** for a correct answer; **-1** for an incorrect MCQ; **no negative marking** for TITA questions; and **0** for an unanswered question.

(vi) For TITA questions, enter the answer in the space provided. An on-screen calculator was available in the original test.

Verbal Ability and Reading Comprehension · Questions 1-24

1. The four sentences (labelled 1, 2, 3 and 4) 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. Various industrial sectors including retail, transit systems, enterprises, educational institutions, event organizing, finance, travel etc. have now started leveraging these beacons solutions to track and communicate with their customers. 2. A beacon fixed on to a shop wall enables the retailer to assess the proximity of the customer, and come up with a much targeted or personalized communication like offers, discounts and combos on products in each shelf. 3. Smartphones or other mobile devices can capture the beacon signals, and distance can be estimated by measuring received signal strength. 4. Beacons are tiny and inexpensive, micro-location-based technology devices that can send radio frequency signals and notify nearby Bluetooth devices of their presence and transmit information.

Type in the answer.

Questions 2 to 5

The passage below is accompanied by a set of questions. Choose the best answer to each question.

Sociologists working in the Chicago School tradition have focused on how rapid or dramatic social change causes increases in crime. Just as Durkheim, Marx, Toennies, and other European sociologists thought that the rapid changes produced by industrialization and urbanization produced crime and disorder, so too did the Chicago School theorists. The location of the University of Chicago provided an excellent opportunity for Park, Burgess, and McKenzie to study the social ecology of the city. Shaw and McKay found . . . that areas of the city characterized by high levels of social disorganization had higher rates of crime and delinquency.

In the 1920s and 1930s Chicago, like many American cities, experienced considerable immigration. Rapid population growth is a disorganizing influence, but growth resulting from in-migration of very different people is particularly disruptive. Chicago's in-migrants were both native-born whites and blacks from rural areas and small towns, and foreign immigrants. The heavy industry of cities like Chicago, Detroit, and Pittsburgh drew those seeking opportunities and new lives. Farmers and villagers from America's hinterland, like their European cousins of whom Durkheim wrote, moved in large numbers into cities. At the start of the twentieth century, Americans were predominately a rural population, but by the century's mid-point, most lived in urban areas. The social lives of these migrants, as well as those already living in the cities they moved to, were disrupted by the differences between urban and rural life. According to social disorganization theory, until the social ecology of the "new place" can adapt, this rapid change is a criminogenic influence. But most rural migrants, and even many of the foreign immigrants to the city, looked like and eventually spoke the same language as the natives of the cities into which they moved. These similarities allowed for more rapid social integration for these migrants than was the case for African Americans and most foreign immigrants.

In these same decades, America experienced what has been called "the great migration": the massive movement of African Americans out of the rural South and into northern (and some southern) cities. The scale of this migration is one of the most dramatic in human history. These migrants, unlike their white counterparts, were not integrated into the cities they now called home. In fact, most American cities at the end of the twentieth century were characterized by high levels of racial residential segregation . . . Failure to integrate these immigrants, coupled with other forces of social disorganization such as crowding, poverty, and illness, caused crime rates to climb in the cities,

particularly in the segregated wards and neighbourhoods where the migrants were forced to live.

Foreign immigrants during this period did not look as dramatically different from the rest of the population as blacks did, but the migrants from eastern and southern Europe who came to American cities did not speak English, and were frequently Catholic, while the native born were mostly Protestant. The combination of rapid population growth with the diversity of those moving into the cities created what the Chicago School sociologists called social disorganization.

2. Which one of the following sets of words/phrases best encapsulates the issues discussed in the passage?

(A) Chicago School; Native-born Whites; European immigrants; Poverty

(B) Chicago School; Social organisation; Migration; Crime

(C) Durkheim; Marx; Toennies; Shaw

(D) Rapid population growth; Heavy industry; Segregation; Crime

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3. A fundamental conclusion by the author is that:

(A) according to European sociologists, crime in America is mainly in Chicago.

(B) the best circumstances for crime to flourish are when there are severe racial disparities.

(C) to prevent crime, it is important to maintain social order through maintaining social segregation.

(D) rapid population growth and demographic diversity give rise to social disorganization that can feed the growth of crime.

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4. Which one of the following is not a valid inference from the passage?

(A) The failure to integrate in-migrants, along with social problems like poverty, was a significant reason for the rise in crime in American cities.

(B) According to social disorganisation theory, the social integration of African American migrants into Chicago was slower because they were less organised.

(C) The differences between urban and rural lifestyles were crucial factors in the disruption experienced by migrants to American cities.

(D) According to social disorganisation theory, fast-paced social change provides fertile ground for the rapid growth of crime.

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5. The author notes that, “At the start of the twentieth century, Americans were predominately a rural population, but by the century’s mid-point most lived in urban areas.” Which one of the following statements, if true, does not contradict this statement?

(A) Economists have found that throughout the twentieth century, the size of the labour force in America has always been largest in rural areas.

(B) A population census conducted in 1952 showed that more Americans lived in rural areas than in urban ones.

(C) The estimation of per capita income in America in the mid-twentieth century primarily required data from rural areas.

(D) Demographic transition in America in the twentieth century is strongly marked by an out-migration from rural areas.

Questions 6 to 9

The passage below is accompanied by a set of questions. Choose the best answer to each question.

Nature has all along yielded her flesh to humans. First, we took nature's materials as food, fibers, and shelter. Then we learned to extract raw materials from her biosphere to create our own new synthetic materials. Now Bios is yielding us her mind—we are taking her logic.

Clockwork logic—the logic of the machines—will only build simple contraptions. Truly complex systems such as a cell, a meadow, an economy, or a brain (natural or artificial) require a rigorous non-technological logic. We now see that no logic except bio-logic can assemble a thinking device, or even a workable system of any magnitude.

It is an astounding discovery that one can extract the logic of Bios out of biology and have something useful. Although many philosophers in the past have suspected one could abstract the laws of life and apply them elsewhere, it wasn't until the complexity of computers and human-made systems became as complicated as living things, that it was possible to prove this. It's eerie how much of life can be transferred. So far, some of the traits of the living that have successfully been transported to mechanical systems are: self-replication, self-governance, limited self-repair, mild evolution, and partial learning.

We have reason to believe yet more can be synthesized and made into something new. Yet at the same time that the logic of Bios is being imported into machines, the logic of Technos is being imported into life. The root of bioengineering is the desire to control the organic long enough to improve it. Domesticated plants and animals are examples of technos-logic applied to life. The wild aromatic root of the Queen Anne's lace weed has been fine-tuned over generations by selective herb gatherers until it has evolved into a sweet carrot of the garden; the udders of wild bovines have been selectively enlarged in an "unnatural" way to satisfy humans rather than calves. Milk cows and carrots, therefore, are human inventions as much as steam engines and gunpowder are. But milk cows and carrots are more indicative of the kind of inventions humans will make in the future: products that are grown rather than manufactured.

Genetic engineering is precisely what cattle breeders do when they select better strains ofHolsteins, only bioengineers employ more precise and powerful control. While carrot and milk cow breeders had to rely on diffuse organic evolution, modern genetic engineers can use directed artificial evolution—purposeful design—which greatly accelerates improvements.

The overlap of the mechanical and the lifelike increases year by year. Part of this bionic convergence is a matter of words. The meanings of "mechanical" and "life" are both stretching until all complicated things can be perceived as machines, and all self-sustaining machines can be perceived as alive. Yet beyond semantics, two concrete trends are happening: (1)Human-made things are behaving more lifelike, and (2) Life is becoming more engineered. The apparent veil between the organic and the manufactured has crumpled to reveal that the two really are, and have always been, of one being.

6. Which one of the following sets of words/phrases best serves as keywords to thepassage?

(A) Complex systems; Carrots; Milk cows; Convergence; Technos-logic

(B) Nature; Computers; Carrots; Milk cows; Genetic engineering

(C) Nature; Bios; Technos; Self-repair; Holsteins

(D) Complex systems; Bio-logic; Bioengineering; Technos-logic; Convergence

7. The author claims that, “Part of this bionic convergence is a matter of words”. Which one of the following statements best expresses the point being made by the author?

(A) “Bios” and “Technos” are both convergent forms of logic, but they generate meanings about the world that are mutually exclusive.

(B) “Mechanical” and “life” are words from different logical systems and are, therefore,fundamentally incompatible in meaning.

(C) A bionic convergence indicates the meeting ground of genetic engineering and artificial intelligence.

(D) “Mechanical” and “life” were earlier seen as opposite in meaning, but the difference between the two is increasingly blurred.

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8. The author claims that, “The apparent veil between the organic and the manufactured has crumpled to reveal that the two really are, and have always been, of one being.”Which one of the following statements best expresses the point being made by the author here?

(A) Organic reality has crumpled under the veil of manufacturing, rendering the apparent and the real as the same being.

(B) The crumpling of the organic veil between apparent and manufactured reality reveals them to have the same being.

(C) Scientific advances are making it increasingly difficult to distinguish between organic reality and manufactured reality.

(D) Apparent reality and organic reality are distinguished by the fact that the former is manufactured.

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9. None of the following statements is implied by the arguments of the passage, EXCEPT:

(A) historically, philosophers have known that the laws of life can be abstracted and applied elsewhere.

(B) genetic engineers and bioengineers are the same insofar as they both seek to force evolution in an artificial way.

(C) the biological realm is as complex as the mechanical one; which is why the logic of Bios is being imported into machines.

(D) purposeful design represents the pinnacle of scientific expertise in the service of human betterment and civilisational progress.

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10. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage. Tamsin Blanchard, curator of Fashion Open Studio, an initiative by a campaign group showcasing the work of ethical designers says, “We're all drawn to an exquisite piece of embroidery, a colourful textile or even a style of dressing that might have originated from another heritage. [But] this magpie mentality, where all of culture and history is up for grabs as 'inspiration', has accelerated since the proliferation of social media...Where once a fashion student might research the history and traditions of a particular item of clothing with care and respect, we now have a world where images are lifted from image libraries without a care for their cultural significance. It's easier than ever to steal a motif or a craft technique and transfer it on to a piece of clothing that is either mass produced or appears on a runway without credit or compensation to their original communities."

(A) Copying an embroidery design or pattern of textile from native communities who own them is tantamount to stealing, and they need to be compensated.

(B) Media has encouraged mass production; images are copied effortlessly without care or concern for the interests of ethnic communities.

(C) Taking fashion ideas from any cultural group without their consent is a form of appropriation without giving due credit, compensation, and respect.

(D) Cultural collaboration is the need of the hour. Beautiful design ideas of indigenous people need to be showcased and shared worldwide.

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11. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the following sentence would best fit. Sentence: When people socially learn from each other, they often learn without understanding why what they're copying—the beliefs and behaviours and technologies and know-how—works. Paragraph: ___(1)___. The dual-inheritance theory ….says....that inheritance is itself an evolutionary system. It has variation. What makes us a new kind of animal, and so different and successful as a species, is we rely heavily on social learning, to the point where socially acquired information is effectively a second line of inheritance, the first being our genes…. ___(2)___. People tend to home in on who seems to be the smartest or most successful person around, as well as what everybody seems to be doing—the majority of people have something worth learning. ___(3)___. When you repeat this process over time, you can get, around the world, cultural packages—beliefs or behaviours or technology or other solutions—that are adapted to the local conditions. People have different psychologies, effectively. ___(4)___.

(A) Option 1

(B) Option 2

(C) Option 3

(D) Option 4

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12. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage. "It does seem to me that the job of comedy is to offend, or have the potential to offend, and it cannot be drained of that potential," Rowan Atkinson said of cancel culture."Every joke has a victim. That's the definition of a joke. Someone or something or an idea is made to look ridiculous." The Netflix star continued, "I think you've got to be very, very careful about saying what you're allowed to make jokes about. You've always got to kick up? Really?" He added, "There are lots of extremely smug and self-satisfied people in what would be deemed lower down in society, who also deserve to be pulled up. In a proper free society, you should be allowed to make jokes about absolutely anything."

(A) All jokes target someone and one should be able to joke about anyone in the society, which is inconsistent with cancel culture.

(B) Every joke needs a victim and one needs to include people from lower down the society and not just the upper class.

(C) Victims of jokes must not only be politicians and royalty, but also arrogant people from lower classes should be mentioned by comedians.

(D) Cancel culture does not understand the role and duty of comedians, which is to deride and mock everyone.

Questions 13 to 16

A set of questions accompanies the passage below. Choose the best answer to each question.

Interpretations of the Indian past . . . were inevitably influenced by colonial concerns and interests, and also by prevalent European ideas about history, civilization and the Orient. Orientalist scholars studied the languages and the texts with selected Indian scholars, but made little attempt to understand the worldview of those who were teaching them. The readings, therefore, are something of a disjuncture from the traditional ways of looking at the Indian past. . . .

Orientalism [which we can understand broadly as Western perceptions of the Orient] fuelled the fantasy and the freedom sought by European Romanticism, particularly in its opposition to the more disciplined Neo-Classicism. The cultures of Asia were seen as bringing a new Romantic paradigm. Another Renaissance was anticipated through an acquaintance with the Orient, and this, it was thought, would be different from the earlier Greek Renaissance. It was believed that this Oriental Renaissance would liberate European thought and literature from the increasing focus on discipline and rationality that had followed from the earlier Enlightenment. . . . [The Romantic English poets, Wordsworth and Coleridge,] were apprehensive of the changes introduced by industrialization and turned to nature and to fantasies of the Orient.

However, this enthusiasm gradually changed, to conform with the emphasis later in the nineteenth century on the innate superiority of European civilization. Oriental civilizations were now seen as having once been great but currently in decline. The various phases of Orientalism tended to mould European understanding of the Indian past into a particular pattern. . . . There was an attempt to formulate Indian culture as uniform, such formulations being derived from texts that were given priority. The so-called 'discovery' of India was largely through selected literature in Sanskrit. This interpretation tended to emphasize non-historical aspects of Indian culture, for example, the idea of an unchanging continuity of society and religion over 3,000 years; and it was believed that the Indian pattern of life was so concerned with metaphysics and the subtleties of religious belief that little attention was given to the more tangible aspects.

German Romanticism endorsed this image of India, and it became the mystic land for many Europeans, where even the most ordinary actions were imbued with a complex symbolism. This was the genesis of the idea of the spiritual east, and also, incidentally, the refuge of European intellectuals seeking to distance themselves from the changing patterns of their own societies. A dichotomy in values was maintained, Indian values being described as 'spiritual' and European values as 'materialistic', with little attempt to juxtapose these values with the reality of Indian society. This theme has been even more firmly endorsed by a section of Indian opinion during the last hundred years.

It was a consolation to the Indian intelligentsia for its perceived inability to counter the technical superiority of the west, a superiority viewed as having enabled Europe to colonize Asia and other parts of the world. At the height of anti-colonial nationalism it acted as a salve for having been made a colony of Britain.

13. It can be inferred from the passage that to gain a more accurate view of a nation's history and culture, scholars should do all of the following EXCEPT:

(A) develop an oppositional framework to grasp cultural differences.

(B) examine their own beliefs and biases.

(C) read widely in the country's literature.

(D) examine the complex reality of that nation's society.

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14. It can be inferred from the passage that the author is not likely to support the view that:

(A) India's culture has evolved over the centuries.

(B) the Orientalist view of Asia fired the imagination of some Western poets.

(C) India became a colony although it matched the technical knowledge of the West.

(D) Indian culture acknowledges the material aspects of life.

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15. In the context of the passage, all of the following statements are true EXCEPT:

(A) Indian texts influenced Orientalist scholars.

(B) Orientalist scholarship influenced Indians.

(C) India's spiritualism served as a salve for European colonisers.

(D) Orientalists' understanding of Indian history was linked to colonial concerns.

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16. Which one of the following styles of research is most similar to the Orientalist scholars' method of understanding Indian history and culture?

(A) Studying artefacts excavated at a palace to understand the lifestyle of those who lived there.

(B) Reading 18th century accounts by travellers to India to see how they viewed Indian life and culture of the time.

(C) Reading about the life of early American settlers and later waves of migration to understand the evolution of American culture.

(D) Analysing Hollywood action movies that depict violence and sex to understand contemporary America.

Questions 17 to 20

The passage below is accompanied by a set of questions. Choose the best answer to each question.

As software improves, the people using it become less likely to sharpen their own know-how. Applications that offer lots of prompts and tips are often to blame; simpler, less solicitous programs push people harder to think, act and learn.

Ten years ago, information scientists at Utrecht University in the Netherlands had a group of people carry out complicated analytical and planning tasks using either rudimentary software that provided no assistance or sophisticated software that offered a great deal of aid. The researchers found that the people using the simple software developed better strategies, made fewer mistakes and developed a deeper aptitude for the work. The people using the more advanced software, meanwhile, would often "aimlessly click around" when confronted with a tricky problem. The supposedly helpful software actually short-circuited their thinking and learning.

[According to] philosopher Hubert Dreyfus . . . . our skills get sharper only through practice, when we use them regularly to overcome different sorts of difficult challenges. The goal of modern software, by contrast, is to ease our way through such challenges. Arduous, painstaking work is exactly what programmers are most eager to automate—after all, that is where the immediate efficiency gains tend to lie. In other words, a fundamental tension ripples between the interests of the people doing the automation and the interests of the people doing the work.

Nevertheless, automation's scope continues to widen. With the rise of electronic health records, physicians increasingly rely on software templates to guide them through patient exams. The programs incorporate valuable checklists and alerts, but they also make medicine more routinized and formulaic—and distance doctors from their patients. . . . Harvard Medical School professor Beth Lown, in a 2012 journal article . . . warned that when doctors become"screen-driven," following a computer's prompts rather than "the patient's narrative thread," their thinking can become constricted. In the worst cases, they may miss important diagnostic signals. . . .

In a recent paper published in the journal Diagnosis, three medical researchers . . . examined the misdiagnosis of Thomas Eric Duncan, the first person to die of Ebola in the U.S., at Texas Health

Presbyterian Hospital Dallas. They argue that the digital templates used by the hospital's clinicians to record patient information probably helped to induce a kind of tunnel vision. "These highly constrained tools," the researchers write, "are optimized for data capture but at the expense of sacrificing their utility for appropriate triage and diagnosis, leading users to miss the forest for the trees." Medical software, they write, is no "replacement for basic history-taking, examination skills, and critical thinking." . . .

There is an alternative. In "human-centred automation," the talents of people take precedence. . . . In this model, software plays an essential but secondary role. It takes over routine functions that a human operator has already mastered, issues alerts when unexpected situations arise, provides fresh information that expands the operator's perspective and counters the biases that often distort human thinking. The technology becomes the expert's partner, not the expert's replacement.

17. In the Ebola misdiagnosis case, we can infer that doctors probably missed the forest for the trees because:

(A) they were led by the data processed by digital templates

(B) the data collected were not sufficient for appropriate triage.

(C) the digital templates forced them to acquire tunnel vision.

(D) they used the wrong type of digital templates for the case.

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18. In the context of the passage, all of the following can be considered examples of human-centered automation EXCEPT:

(A) medical software that provides optional feedback on the doctor's analysis of the medical situation.

(B) a smart-home system that changes the temperature as instructed by the resident.

(C) software that auto-completes text when the user writes an email.

(D) software that offers interpretations when requested by the human operator.

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19. From the passage, we can infer that the author is apprehensive about the use of sophisticated automation for all of the following reasons EXCEPT that:

(A) it stunts the development of its users.

(B) it could mislead people.

(C) computers could replace humans.

(D) it stops users from exercising their minds.

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20. It can be inferred that in the Utrecht University experiment, one group of people was"aimlessly clicking around" because:

(A) they did not have the skill-set to address complicated tasks.

(B) they were hoping that the software would help carry out the tasks.

(C) the other group was carrying out the tasks more efficiently.

(D) they wanted to avoid making mistakes.

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21. The four sentences (labelled 1, 2, 3 and 4) 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 more we are able to accept that our achievements are largely out of our control, the easier it becomes to understand that our failures, and those of others, are too. 2. But the raft of recent books about the limits of merit is an important correction to the arrogance of contemporary

entitlement and an opportunity to reassert the importance of luck, or grace, in our thinking. 3. Meritocracy as an organising principle is an inevitable function of a free society, as we are designed to see our achievements as worthy of reward. 4. And that in turn should increase our humility and the respect with which we treat our fellow citizens, helping ultimately to build a more compassionate society.

Type in the answer.

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22. The four sentences (labelled 1, 2, 3 and 4) 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. If I wanted to sit indoors and read, or play Sonic the Hedgehog on a red-hot SegaMega Drive, I would often be made to feel guilty about not going outside to "enjoy it while it lasts". 2. My mum, quite reasonably, wanted me and my sister out of the house, in the sun. 3. Tales of my mum's idyllic-sounding childhood in the Sussex countryside, where trees were climbed by 8 am and streams navigated by lunchtime, were passed down to us like folklore. 4. To an introverted kid, that felt like a threat - and the feeling has stayed with me.

Type in the answer.

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23. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage. To defend the sequence of alphabetisation may seem bizarre, so obvious is its application that it is hard to imagine a reference, catalogue or listing without it. But alphabetical order was not an immediate consequence of the alphabet itself. In the Middle Ages, deference for ecclesiastical tradition left scholars reluctant to categorise things according to the alphabet — to do so would be a rejection of the divine order. The rediscovery of the ancient Greek and Roman classics necessitated more efficient ways of ordering, searching and referencing texts. Government bureaucracy in the 16th and 17th centuries quickened the advance of alphabetical order, bringing with it pigeonholes, notebooks and card indexes.

(A) Unlike the alphabet, once the efficacy of the alphabetic sequence became apparent to scholars and administrators, its use became widespread.

(B) The alphabetic order took several centuries to gain common currency because of religious beliefs and a lack of appreciation of its efficacy in the ordering of things.

(C) The ban on the use by scholars of any form of categorisation - but the divinely ordained one - delayed the adoption of the alphabetic sequence by several centuries.

(D) While adoption of the written alphabet was easily accomplished, it took scholars several centuries to accept the alphabetic sequence as a useful tool in their work.

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24. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the following sentence would best fit. Sentence: This has meant a lot of uncertainty around what a wide-scale return to office might look like in practice. Paragraph: Bringing workers back to their desks has been a rocky road for employers and employees alike. The evolution of the pandemic has meant that best-laid plans have often not materialised. ___(1)___ The flow of workers back into offices has been more of a trickle than a steady stream. ___(2)___ Yet while plenty of companies are still working through their new policies, some employees across the globe are now back at their desks, whether on a full-time or hybrid basis. ___(3)___ That means we're beginning to get some clarity on what return-to-office means - what's working, as well as what has yet to be settled. ___(4)___

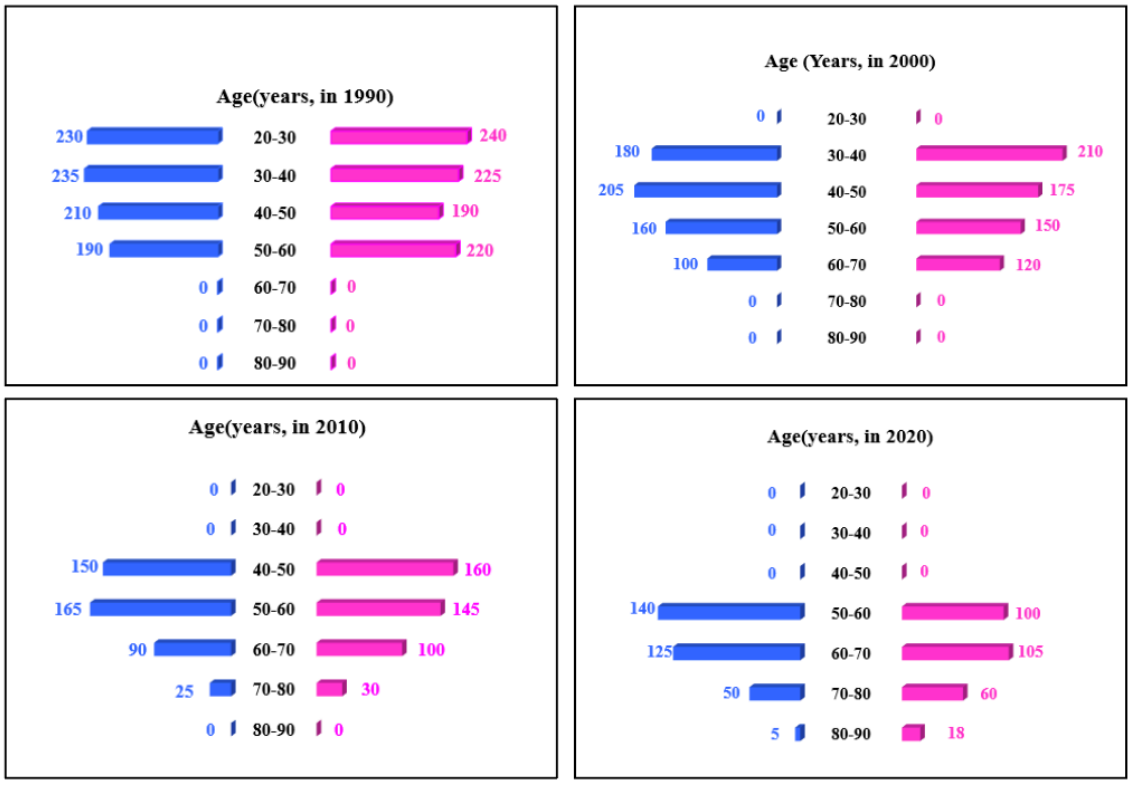
(A) Option 1
(B) Option 2
(C) Option 3
(D) Option 4

Questions 25 to 29

In the following, a year corresponds to 1st of January of that year.

A study to determine the mortality rate for a disease began in 1980. The study chose 1000 males and 1000 females and followed them for forty years or until they died, whichever came first. The 1000 males chosen in 1980 consisted of 250 each of ages 10 to less than 20, 20 to less than 30, 30 to less than 40, and 40 to less than 50. The 1000 females chosen in 1980 also consisted of 250 each of ages 10 to less than 20, 20 to less than 30, 30 to less than 40,and 40 to less than 50.

The four figures below depict the age profile of those among the 2000 individuals who were still alive in 1990, 2000, 2010, and 2020. The blue bars in each figure represent the number of males in each age group at that point in time, while the pink bars represent the number of females in each age group at that point in time. The numbers next to the bars give the exact numbers being represented by the bars. For example, we know that 230 males among those tracked and who were alive in 1990 were aged between 20 and 30.



25. In 2000, what was the ratio of the number of dead males to dead females among those being tracked?

(A) 71 : 69

(B) 41 : 43

(C) 129 : 131

(D) 109 : 107

26. How many people who were being tracked and who were between 30 and 40 years of age in 1980 survived until 2010?

(A) 110
(B) 90
(C) 190
(D) 310

27. How many individuals who were being tracked and who were less than 30 years of age in 1980 survived until 2020?

(A) 240
(B) 580
(C) 470
(D) 230

28. How many of the males who were being tracked and who were between 20 and 30 years of age in 1980 died in the period 2000 to 2010?

Type in the answer.

29. How many of the females who were being tracked and who were between 20 and 30 years of age in 1980 died between the ages of 50 and 60?

Type in the answer.

Questions 30 to 34

There are only four neighbourhoods in a city - Levmisto, Tyhrmisto, Pesmisto and Kitmisto.During the onset of a pandemic, the number of new cases of a disease in each of these neighbourhoods was recorded over a period of five days. On each day, the number of newcases recorded in any of the neighbourhoods was either 0, 1, 2 or 3.

The following facts are also known:

1.There was at least one new case in every neighbourhood on Day 1.
2.On each of the five days, there were more new cases in Kitmisto than in Pesmisto.
3.The number of new cases in the city in a day kept increasing during the five-day period. The number of new cases on Day 3 was exactly one more than that on Day 2.
4.The maximum number of new cases in a day in Pesmisto was 2, and this happened only once during the five-day period.
5.Kitmisto is the only place to have 3 new cases on Day 2.
6.The total numbers of new cases in Levmisto, Tyhrmisto, Pesmisto and Kitmisto over the five-day period were 12, 12, 5 and 14 respectively.

30. What BEST can be concluded about the total number of new cases in the city on Day2?

(A) Either 7 or 8
(B) Exactly 7
(C) Either 6 or 7
(D) Exactly 8

31. What BEST can be concluded about the number of new cases in Levmisto on Day 3?

(A) Either 2 or 3
(B) Exactly 2
(C) Exactly 3
(D) Either 0 or 1

32. On which day(s) did Pesmisto not have any new case?

(A) Only Day 3
(B) Only Day 2
(C) Both Day 2 and Day 3
(D) Both Day 2 and Day 4

33. Which of the two statements below is/are necessarily false? Statement A: There were 2 new cases in Tyhrmisto on Day 3. Statement B: There were no new cases in Pesmisto on Day 2.

(A) Statement A only
(B) Neither Statement A nor Statement B
(C) Statement B only
(D) Both Statement A and Statement B

34. On how many days did Levmisto and Tyhrmisto have the same number of new cases?

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

Questions 35 to 39

All the first-year students in the computer science (CS) department in a university take both the courses (i) AI and (ii) ML. Students from other departments (non-CS students) can also take one of these two courses, but not both. Students who fail in a course get an F grade;others pass and are awarded A or B or C grades depending on their performance. The following are some additional facts about the number of students who took these two courses this year and the grades they obtained.

1.The numbers of non-CS students who took AI and ML were in the ratio 2 : 5.
2.The number of non-CS students who took either AI or ML was equal to the number of CS students.
3.The numbers of non-CS students who failed in the two courses were the same and their total is equal to the number of CS students who got a C grade in ML.
4. In both the courses, 50% of the students who passed got a B grade. But, while the numbers of students who got A and C grades were the same for AI, they were in the ratio 3 :2 for ML.
5. No CS student failed in AI, while no non-CS student got an A grade in AI.
6.The numbers of CS students who got A, B and C grades respectively in AI were in the ratio 3 : 5 : 2, while in ML the ratio was 4 : 5 : 2.
7.The ratio of the total number of non-CS students failing in one of the two courses to the number of CS students failing in one of the two courses was 3 : 1.
8. 30 students failed in ML.

35. How many students took AI?

(A) 60
(B) 210
(C) 90
(D) 270

36. How many CS students failed in ML?

Type in the answer.

37. How many non-CS students got A grade in ML?

Type in the answer.

38. How many students got A grade in AI?

(A) 99
(B) 42
(C) 84
(D) 63

39. How many non-CS students got B grade in ML?

(A) 165
(B) 75
(C) 25
(D) 90

Questions 40 to 44

Pulak, Qasim, Ritesh, and Suresh participated in a tournament comprising of eight rounds. In each round, they formed two pairs, with each of them being in exactly one pair. The only restriction in the pairing was that the pairs would change in successive rounds. For example, if Pulak formed a pair with Qasim in the first round, then he would have to form a pair with Ritesh or Suresh in the second round. He would be free to pair with Qasim again in the third round. In each round, each pair decided whether to play the game in that round or not. If they decided not to play, then no money was exchanged between them. If they decided to play, they had to bet either ₹1 or ₹2 in that round. For example, if they chose to bet ₹2, then the player winning the game got ₹2 from the one losing the game.

At the beginning of the tournament, the players had ₹10 each. The following table shows partial information about the amounts that the players had at the end of each of the eightrounds. It shows every time a player had ₹10 at the end of a round, as well as every time, at the end of a round, a player had either the minimum or the maximum amount that he would have had across the eight rounds. For example, Suresh had ₹10 at the end of Rounds 1, 3 and 8 and not after any of the other rounds. The maximum amount that he had at the end of any round was ₹13 (at the end of Round 5), and the minimum amount he had at the end of any round was ₹8 (at the end of Round 2). At the end of all other rounds, he must have had either ₹9, ₹11, or ₹12.

It was also known that Pulak and Qasim had the same amount of money with them at the end of Round 4.

	Pulak	Qasim	Ritesh	Suresh
Round 1		₹8	₹10	₹10
Round 2	₹13	₹10		₹8
Round 3				₹10
Round 4				
Round 5	₹10	₹10		₹13
Round 6				
Round 7		₹12	₹4	
Round 8	₹13			₹10

40. What BEST can be said about the amount of money that Ritesh had with him at the end of Round 8?

(A) ₹4 or ₹5
(B) Exactly ₹5
(C) ₹5 or ₹6
(D) Exactly ₹6

41. What BEST can be said about the amount of money that Pulak had with him at the end of Round 6?

(A) Exactly ₹12
(B) Exactly ₹11
(C) ₹12 or ₹13
(D) ₹11 or ₹12

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42. How much money (in ₹) did Ritesh have at the end of Round 4?

Type in the answer.

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43. How many games were played with a bet of ₹2?

Type in the answer.

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44. Which of the following pairings was made in Round 5?

(A) Qasim and Suresh
(B) Pulak and Ritesh
(C) Pulak and Qasim
(D) Pulak and Suresh

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45. If $c = \frac{16x}{y} + \frac{49y}{x}$ for some non-zero real numbers x and y, then c cannot take the value

(A) 60
(B) -50
(C) -70
(D) -60

---

46. Suppose k is any integer such that the equation $2x^2 + kx + 5 = 0$ has no real roots and the equation $x^2 + (k-5)x + 1 = 0$ has two distinct real roots for x. Then, the number of possible values of k is

(A) 9
(B) 7
(C) 8
(D) 13

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47. If $(\sqrt{\frac{7}{5}})^{3x-y} = \frac{875}{2401}$ and $(\frac{4a}{b})^{6x-y} = (\frac{2a}{b})^{y-6x}$, for all non-zero real values of a and b, then the value of $x + y$ is

Type in the answer.

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48. Consider six distinct natural numbers such that the average of the two smallest numbers is 14, and the average of the two largest numbers is 28. Then, the maximum possible value of the average of these six numbers is

(A) 23
(B) 24
(C) 23.5
(D) 22.5

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49. Suppose the medians BD and CE of a triangle ABC intersect at a point O. If area of triangle ABC is 108 sq. cm., then, the area of the triangle EOD, in sq. cm., is

Type in the answer.

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50. If $(3 + 2\sqrt{2})$ is a root of the equation $ax^2 + bx + c = 0$ and $(4 + 2\sqrt{3})$ is a root of the equation $ay^2 + my + n = 0$ where a, b, c, m and n are integers, then the value of $(\frac{b}{m} + \frac{c-2b}{n})$ is

(A) 0
(B) 1
(C) 3
(D) 4

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51. A group of N people worked on a project. They finished 35% of the project by working 7 hours a day for 10 days. Thereafter, 10 people left the group and the remaining people finished the rest of the project in 14 days by working 10 hours a day. Then the value of N is

(A) 150
(B) 23
(C) 36
(D) 140

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52. A glass contains 500 cc of milk and a cup contains 500 cc of water. From the glass, 150 cc of milk is transferred to the cup and mixed thoroughly. Next, 150 cc of this mixture is transferred from the cup to the glass. Now, the amount of water in the glass and the amount of milk in the cup are in the ratio

(A) 1 : 1
(B) 10 : 13
(C) 3 : 10
(D) 10 : 3

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53. Nitu has an initial capital of ₹20,000. Out of this, she invests ₹8,000 at 5.5% in bank A, ₹5,000 at 5.6% in bank B and the remaining amount at x% in bank C, each rate being simple interest per annum. Her combined annual interest income from these investments is equal to 5% of the initial capital. If she had invested her entire initial capital in bank C alone, then her annual interest income, in rupees, would have been

(A) 700
(B) 800
(C) 900
(D) 1000

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54. Two cars travel from different locations at constant speeds. To meet each other after starting at the same time, they take 1.5 hours if they travel towards each other, but 10.5 hours if they travel in the same direction. If the speed of the slower car is 60 km/hr, then the distance traveled, in km, by the slower car when it meets the other car while traveling towards each other, is

(A) 100
(B) 90
(C) 120
(D) 150

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55. The arithmetic mean of all the distinct numbers that can be obtained by rearranging the digits in 1421, including itself, is

(A) 2222
(B) 2442
(C) 2592
(D) 3333

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56. The lengths of all four sides of a quadrilateral are integer valued. If three of its sides are of length 1 cm, 2 cm and 4 cm, then the total number of possible lengths of the fourth side is

(A) 3
(B) 4
(C) 6
(D) 5

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57. The average of all 3-digit terms in the arithmetic progression 38, 55, 72, ..., is

Type in the answer.

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58. In an examination, the average marks of students in sections A and B are 32 and 60, respectively. The number of students in section A is 10 less than that in section B. If the average marks of all the students across both the sections combined is an integer, then the difference between the maximum and minimum possible number of students in section A is

Type in the answer.

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59. Let r be a real number and $f(x) = \begin{cases} 2x - r & if x \geq r \\ r & if x < r \end{cases}$. Then, the equation $f(x) = f(f(x))$ holds for all real values of x where

(A) $x > r$
(B) $x \leq r$
(C) $x \neq r$
(D) $x \geq r$

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60. In a triangle ABC, AB = AC = 8 cm. A circle drawn with BC as diameter passes through A. Another circle drawn with center at A passes through Band C. Then the area, in sq. cm, of the

overlapping region between the two circles is

(A) 16π

(B) $16(\pi - 1)$

(C) $32(\pi - 1)$

(D) 32π

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61. A school has less than 5000 students and if the students are divided equally into teams of either 9 or 10 or 12 or 25 each, exactly 4 are always left out. However, if they are divided into teams of 11 each, no one is left out. The maximum number of teams of 12 each that can be formed out of the students in the school is

Type in the answer.

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62. The minimum possible value of $\frac{x^2 - 6x + 10}{3 - x}$, for $x < 3$, is

(A) $-\frac{1}{2}$

(B) 2

(C) $\frac{1}{2}$

(D) -2

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63. A donation box can receive only cheques of ₹100, ₹250, and ₹500. On one good day, the donation box was found to contain exactly 100 cheques amounting to a total sum of ₹15250. Then, the maximum possible number of cheques of ₹500 that the donation box may have contained, is

Type in the answer.

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64. Moody takes 30 seconds to finish riding an escalator if he walks on it at his normal speed in the same direction. He takes 20 seconds to finish riding the escalator if he walks at twice his normal speed in the same direction. If Moody decides to stand still on the escalator, then the time, in seconds, needed to finish riding the escalator is

Type in the answer.

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65. Two ships are approaching a port along straight routes at constant speeds. Initially, the two ships and the port formed an equilateral triangle with sides of length 24 km. When the slower ship travelled 8 km, the triangle formed by the new positions of the two ships and the port became right-angled. When the faster ship reaches the port, the distance, in km, between the other ship and the port will be

(A) 4

(B) 12

(C) 8

(D) 6

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66. Bob can finish a job in 40 days, if he works alone. Alex is twice as fast as Bob and thrice as fast as Cole in the same job. Suppose Alex and Bob work together on the first day, Bob and Cole work together on the second day, Cole and Alex work together on the third day, and then, they continue the work by repeating this three - day roster, with Alex and Bob working together on the fourth day, and so on. Then, the total number of days Alex would have worked when the job gets finished, is

Type in the answer.

- End of Question Paper -
