

**26** Years

# CAT

**Topic-wise Solved Papers (2019-1994)**

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Practice Sets

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# CAT SOLVED PAPER-2019

(SLOT-I)

Test Date: 24/11/2019

Test Time: 9:00 AM - 12:00 PM

## SECTION : VERBAL ABILITY

**DIRECTIONS (Qs. 1-5):** Read the passage and answer the questions based on it.

“Free of the taint of manufacture” – that phrase, in particular, is heavily loaded with the ideology of what the Victorian socialist William Morris called the “anti-scrape”, or an anti-capitalist conservatism (not conservatism) that solaced itself with the vision of a preindustrial golden age. In Britain, folk may often appear a cosy, fossilised form, but when you look more closely, the idea of folk – who has the right to sing it, dance it, invoke it, collect it, belong to it or appropriate it for political or cultural ends – has always been contested territory.

In our own time, though, the word “folk” . . . has achieved the rare distinction of occupying fashionable and unfashionable status simultaneously. Just as the effusive floral prints of the radical William Morris now cover genteel sofas, so the revolutionary intentions of many folk historians and revivalists have led to music that is commonly regarded as parochial and conservative. And yet – as newspaper columns periodically rejoice – folk is hip again, influencing artists, clothing and furniture designers, celebrated at music festivals, awards ceremonies and on TV, reissued on countless record labels. Folk is a sonic “shabby chic”, containing elements of the uncanny and eerie, as well as an antique veneer, a whiff of Britain’s heathen dark ages. The very obscurity and anonymity of folk music’s origins open up space for rampant imaginative fancies. . . .

[Cecil Sharp, who wrote about this subject, believed that] folk songs existed in constant transformation, a living example of an art form in a perpetual state of renewal. “One man sings a song, and then others sing it after him, changing what they do not like” is the most concise summary of his conclusions on its origins. He compared each rendition of a ballad to an acorn falling from an oak tree; every subsequent iteration sows the song anew. But there is tension in newness. In the late 1960s, purists were suspicious of folk songs recast in rock idioms. Electrification, however, comes in many forms. For the early-20th-century composers such as Vaughan Williams and Hoist, there were thunderbolts of inspiration from oriental mysticism, angular modernism and the body blow of the first world war, as well as input from the rediscovered folk tradition itself.

For the second wave of folk revivalists, such as Ewan MacColl and AL Lloyd, starting in the 40s, the vital spark was communism’s dream of a post-revolutionary New Jerusalem. For their younger

successors in the 60s, who thronged the folk clubs set up by the old guard, the lyrical freedom of Dylan and the unchained melodies of psychedelia created the conditions for folkrock’s own golden age, a brief Indian summer that lasted from about 1969 to 1971. . . . Four decades on, even that progressive period has become just one more era ripe for fashionable emulation and pastiche. The idea of a folk tradition being exclusively confined to oral transmission has become a much looser, less severely guarded concept. Recorded music and television, for today’s metropolitan generation, are where the equivalent of folk memories are seeded. . . .

1. All of the following are causes for plurality and diversity within the British folk tradition EXCEPT:
  - (a) paradoxically, folk forms are both popular and unpopular.
  - (b) that British folk continues to have traces of pagan influence from the dark ages.
  - (c) that British folk forms can be traced to the remote past of the country.
  - (d) the fluidity of folk forms owing to their history of oral mode of transmission.
2. At a conference on folk forms, the author of the passage is least likely to agree with which one of the following views?
  - (a) The power of folk resides in its contradictory ability to influence and be influenced by the present while remaining rooted in the past.
  - (b) Folk forms, despite their archaic origins, remain intellectually relevant in contemporary times.
  - (c) Folk forms, in their ability to constantly adapt to the changing world, exhibit an unusual poise and homogeneity with each change.
  - (d) The plurality and democratising impulse of folk forms emanate from the improvisation that its practitioners bring to it.
3. The primary purpose of the reference to William Morris and his floral prints is to show:
  - (a) the pervasive influence of folk on contemporary art, culture, and fashion.
  - (b) that what was once derided as genteel is now considered revolutionary.
  - (c) that what is once regarded as radical in folk, can later be seen as conformist.
  - (d) that despite its archaic origins, folk continues to remain a popular tradition.



4. Which of the following statements about folk revivalism of the 1940s and 1960s cannot be inferred from the passage?
- Even though it led to folk-rock's golden age, it wasn't entirely free from critique.
  - Electrification of music would not have happened without the influence of rock music.
  - Freedom and rebellion were popular themes during the second wave of folk revivalism.
  - It reinforced Cecil Sharp's observation about folk's constant transformation.
5. The author says that folk "may often appear a cosy, fossilised form" because :
- it has been arrogated for various political and cultural purposes.
  - folk is a sonic "shabby chic" with an antique water.
  - the notion of folk has led to several debates and disagreements.
  - of its nostalgic association with a pre-industrial past.

**DIRECTIONS (Qs. 6-10):** Read the passage and answer the questions based on it.

As defined by the geographer Yi-Fu Tuan, topophilia is the affective bond between people and place. His 1974 book set forth a wide-ranging exploration of how the emotive ties with the material environment vary greatly from person to person and in intensity, subtlety, and mode of expression. Factors influencing one's depth of response to the environment include cultural background, gender, race, and historical circumstance, and Tuan also argued that there is a biological and sensory element. Topophilia might not be the strongest of human emotions—indeed, many people feel utterly indifferent toward the environments that shape their lives—but when activated it has the power to elevate a place to become the carrier of emotionally charged events or to be perceived as a symbol.

Aesthetic appreciation is one way in which people respond to the environment. A brilliantly colored rainbow after gloomy afternoon showers, a busy city street alive with human interaction—one might experience the beauty of such landscapes that had seemed quite ordinary only moments before or that are being newly discovered. This is quite the opposite of a second topophilic bond, namely that of the acquired taste for certain landscapes and places that one knows well. When a place is home, or when a space has become the locus of memories or the means of gaining a livelihood, it frequently evokes a deeper set of attachments than those predicated purely on the visual. A third response to the environment also depends on the human senses but may be tactile and olfactory, namely a delight in the feel and smell of air, water, and the earth.

Topophilia—and its very close conceptual twin, sense of place—is an experience that, however elusive, has inspired recent architects and planners. Most notably, new urbanism seeks to counter the perceived placelessness of modern suburbs and the decline of central cities through neo-traditional design motifs. Although

motivated by good intentions, such attempts to create places rich in meaning are perhaps bound to disappoint. As Tuan noted, purely aesthetic responses often are suddenly revealed, but their intensity rarely is long-lasting. Topophilia is difficult to design for and impossible to quantify, and its most articulate interpreters have been self-reflective philosophers such as Henry David Thoreau, evoking a marvelously intricate sense of place at Walden Pond, and Tuan, describing his deep affinity for the desert.

Topophilia connotes a positive relationship, but it often is useful to explore the darker affiliations between people and place. Patriotism, literally meaning the love of one's terra patria or homeland, has long been cultivated by governing elites for a range of nationalist projects, including war preparation and ethnic cleansing. Residents of upscale residential developments have disclosed how important it is to maintain their community's distinct identity, often by casting themselves in a superior social position and by reinforcing class and racial differences. And just as a beloved landscape is suddenly revealed, so too may landscapes of fear cast a dark shadow over a place that makes one feel a sense of dread or anxiety—or topophobia.

6. The word "topophobia" in the passage is used:
- to represent a feeling of dread towards particular spaces and places.
  - to signify the fear of studying the complex discipline of topography.
  - as a metaphor expressing the failure of the homeland to accommodate non-citizens.
  - to signify feelings of fear or anxiety towards topophilic people.
7. Which one of the following best captures the meaning of the statement, "Topophilia is difficult to design for and impossible to quantify . . .?"
- People's responses to their environment are usually subjective and so cannot be rendered in design.
  - The deep anomie of modern urbanisation led to new urbanism's intricate sense of place.
  - Architects have to objectively quantify spaces and hence cannot be topophilic.
  - Philosopher-architects are uniquely suited to develop topophilic design.
8. Which of the following statements, if true, could be seen as not contradicting the arguments in the passage?
- The most important, even fundamental, response to our environment is our tactile and olfactory response.
  - Generally speaking, in a given culture, the ties of the people to their environment vary little in significance or intensity.
  - Patriotism, usually seen as a positive feeling, is presented by the author as a darker form of topophilia.
  - New Urbanism succeeded in those designs where architects collaborated with their clients.

9. Which one of the following comes closest in meaning to the author's understanding of topophilia?
- The tendency of many cultures to represent their land as "motherland" or "fatherland" may be seen as an expression of their topophilia.
  - Nomadic societies are known to have the least affinity for the lands through which they traverse because they tend to be topophobic.
  - The French are not overly patriotic, but they will refuse to use English as far as possible, even when they know it well.
  - Scientists have found that most creatures, including humans, are either born with or cultivate a strong sense of topography.
10. In the last paragraph, the author uses the example of "Residents of upscale residential developments" to illustrate the:
- introduction of nationalist projects by such elites to produce a sense of dread or topophobia.
  - social exclusivism practised by such residents in order to enforce a sense of racial or class superiority.
  - manner in which environments are designed to minimise the social exclusion of their clientele.
  - sensitive response to race and class problems in upscale residential developments.

**DIRECTIONS (Qs. 11-15):** Read the passage and answer the questions based on it.

Contemporary internet shopping conjures a perfect storm of choice anxiety. Research has consistently held that people who are presented with a few options make better, easier decisions than those presented with many. . . . Helping consumers figure out what to buy amid an endless sea of choice online has become a cottage industry unto itself. Many brands and retailers now wield marketing buzzwords such as curation, differentiation, and discovery as they attempt to sell an assortment of stuff targeted to their ideal customer. Companies find such shoppers through the data gold mine of digital advertising, which can catalog people by gender, income level, personal interests, and more. Since Americans have lost the ability to sort through the sheer volume of the consumer choices available to them, a ghost now has to be in the retail machine, whether it's an algorithm, an influencer, or some snazzy ad tech to help a product follow you around the internet. Indeed, choice fatigue is one reason so many people gravitate toward lifestyle influencers on Instagram—the relentlessly chic young moms and perpetually vacationing 20-somethings—who present an aspirational worldview, and then recommend the products and services that help achieve it. . . .

For a relatively new class of consumer-products start-ups, there's another method entirely. Instead of making sense of a sea of existing stuff, these companies claim to disrupt stuff as Americans know it. Casper (mattresses), Glossier (makeup), Away (suitcases), and many others have sprouted up to offer consumers freedom from choice: The companies have a few aesthetically

pleasing and supposedly highly functional options, usually at mid-range prices. They're selling nice things, but maybe more importantly, they're selling a confidence in those things, and an ability to opt out of the stuff rat race. . . .

One-thousand-dollar mattresses and \$300 suitcases might solve choice anxiety for a certain tier of consumer, but the companies that sell them, along with those that attempt to massage the larger stuff economy into something navigable, are still just working within a consumer market that's broken in systemic ways. The presence of so much stuff in America might be more valuable if it were more evenly distributed, but stuff's creators tend to focus their energy on those who already have plenty. As options have expanded for people with disposable income, the opportunity to buy even basic things such as fresh food or quality diapers has contracted for much of America's lower classes.

For start-ups that promise accessible simplicity, their very structure still might eventually push them toward overwhelming variety. Most of these companies are based on hundreds of millions of dollars of venture capital, the investors of which tend to expect a steep growth rate that can't be achieved by selling one great mattress or one great sneaker. Casper has expanded into bedroom furniture and bed linens. Glossier, after years of marketing itself as no-makeup makeup that requires little skill to apply, recently launched a full line of glittering color cosmetics. There may be no way to opt out of stuff by buying into the right thing.

11. Which one of the following best sums up the overall purpose of the examples of Casper and Glossier in the passage?
- They are facilitating a uniform distribution of commodities in the market.
  - They might transform into what they were exceptions to.
  - They are exceptions to a dominant trend in consumer markets.
  - They are increasing the purchasing power of poor Americans.
12. A new food brand plans to launch a series of products in the American market. Which of the following product plans is most likely to be supported by the author of the passage?
- A range of 25 products priced between \$10 and \$25.
  - A range of 10 products priced between \$5 and \$10.
  - A range of 10 products priced between \$10 and \$25.
  - A range of 25 products priced between \$5 and \$10.
13. Based on the passage, all of the following can be inferred about consumer behaviour EXCEPT that:
- too many options have made it difficult for consumers to trust products.
  - consumers tend to prefer products by start-ups over those by established companies.
  - having too many product options can be overwhelming for consumers.
  - consumers are susceptible to marketing images that they see on social media.

14. Which of the following hypothetical statements would add the least depth to the author's prediction of the fate of start-ups offering few product options?
- With Casper and Glossier venturing into new product ranges, their regular customers start losing trust in the companies and their products.
  - Start-ups with few product options are no exception to the American consumer market that is deeply divided along class lines.
  - An exponential surge in their sales enables start-ups to meet their desired profit goals without expanding their product catalogue.
  - With the motive of promoting certain rival companies, the government decides to double the tax-rates for these start-ups.
15. All of the following, IF TRUE, would weaken the author's claims EXCEPT:
- product options increased market competition, bringing down the prices of commodities, which, in turn, increased purchasing power of the poor.
  - the annual sales growth of companies with fewer product options were higher than that of companies which curated their products for target consumers.
  - the empowerment felt by purchasers in buying a commodity were directly proportional to the number of options they could choose from.
  - the annual sale of companies that hired lifestyle influencers on Instagram for marketing their products were 40% less than those that did not.

**DIRECTIONS (Qs. 16-19):** Read the passage and answer the questions based on it.

Scientists recently discovered that Emperor Penguins—one of Antarctica's most celebrated species—employ a particularly unusual technique for surviving the daily chill. As detailed in an article published today in the journal *Biology Letters*, the birds minimize heat loss by keeping the outer surface of their plumage below the temperature of the surrounding air. At the same time, the penguins' thick plumage insulates their body and keeps it toasty. . . .

The researchers analyzed thermographic images . . . taken over roughly a month during June 2008. During that period, the average air temperature was 0.32 degrees Fahrenheit. At the same time, the majority of the plumage covering the penguins' bodies was even colder: the surface of their warmest body part, their feet, was an average 1.76 degrees Fahrenheit, but the plumage on their heads, chests and backs were -1.84, -7.24 and -9.76 degrees Fahrenheit respectively. Overall, nearly the entire outer surface of the penguins' bodies was below freezing at all times, except for their eyes and beaks. The scientists also used a computer simulation to determine how much heat was lost or gained from each part of the body—and discovered that by keeping their outer surface below air temperature, the birds might paradoxically be able to draw very slight amounts of heat from the air around them.

The key to their trick is the difference between two different types of heat transfer: radiation and convection.

The penguins do lose internal body heat to the surrounding air through thermal radiation, just as our bodies do on a cold day. Because their bodies (but not surface plumage) are warmer than the surrounding air, heat gradually radiates outward over time, moving from a warmer material to a colder one. To maintain body temperature while losing heat, penguins, like all warm-blooded animals, rely on the metabolism of food. The penguins, though, have an additional strategy. Since their outer plumage is even colder than the air, the simulation showed that they might gain back a little of this heat through thermal convection—the transfer of heat via the movement of a fluid (in this case, the air). As the cold Antarctic air cycles around their bodies, slightly warmer air comes into contact with the plumage and donates minute amounts of heat back to the penguins, then cycles away at a slightly colder temperature.

Most of this heat, the researchers note, probably doesn't make it all the way through the plumage and back to the penguins' bodies, but it could make a slight difference. At the very least, the method by which a penguin's plumage wicks heat from the bitterly cold air that surrounds it helps to cancel out some of the heat that's radiating from its interior. And given the Emperors' unusually demanding breeding cycle, every bit of warmth counts. . . . Since [penguins trek as far as 75 miles to the coast to breed and male penguins] don't eat anything during [the incubation period of 64 days], conserving calories by giving up as little heat as possible is absolutely crucial.

16. Which of the following best explains the purpose of the word "paradoxically" as used by the author?
- Keeping a part of their body colder helps penguins keep their bodies warmer.
  - Heat loss through radiation happens despite the heat gain through convection.
  - Keeping their body colder helps penguins keep their plumage warmer.
  - Heat gain through radiation happens despite the heat loss through convection.
17. All of the following, if true, would negate the findings of the study reported in the passage EXCEPT:
- The average air temperature recorded during the month of June 2008 in the area of study were -10 degrees Fahrenheit.
  - The average temperature of the feet of penguins in the month of June 2008 were found to be 2.76 degrees Fahrenheit.
  - The temperature of the plumage on the penguins' heads, chests and backs were found to be 1.84, 7.24 and 9.76 degrees Fahrenheit respectively.
  - The penguins' plumage were made of a material that did not allow any heat transfer through convection or radiation.



18. In the last sentence of paragraph 3, “slightly warmer air” and “at a slightly colder temperature” refer to \_\_\_\_\_ AND \_\_\_\_\_ respectively:
- the air inside penguins’ bodies kept warm because of metabolism of food AND the fall in temperature of the body air after it transfers some heat to the plumage.
  - the cold Antarctic air whose temperature is higher than that of the plumage AND the fall in temperature of the Antarctic air after it has transmitted some heat to the plumage.
  - the air trapped in the plumage which is warmer than the Antarctic air AND the fall in temperature of the trapped plumage air after it radiates out some heat.
  - the cold Antarctic air which becomes warmer because of the heat radiated out from penguins’ bodies AND the fall in temperature of the surrounding air after thermal convection.
19. Which of the following can be responsible for Emperor Penguins losing body heat?
- Reproduction process.
  - Thermal convection.
  - Food metabolism.
  - Plumage.

**DIRECTIONS (Qs. 20-24):** Read the passage and answer the questions based on it.

In the past, credit for telling the tale of Aladdin has often gone to Antoine Galland . . . the first European translator of . . . Arabian Nights [which] started as a series of translations of an incomplete manuscript of a medieval Arabic story collection. . . But, though those tales were of medieval origin, Aladdin may be a more recent invention. Scholars have not found a manuscript of the story that predates the version published in 1712 by Galland, who wrote in his diary that he first heard the tale from a Syrian storyteller from Aleppo named Hanna Diyab . . .

Despite the fantastical elements of the story, scholars now think the main character may actually be based on a real person’s real experiences. . . . Though Galland never credited Diyab in his published translations of the Arabian Nights stories, Diyab wrote something of his own: a travelogue penned in the mid-18th century. In it, he recalls telling Galland the story of Aladdin [and] describes his own hard-knocks upbringing and the way he marveled at the extravagance of Versailles. The descriptions he uses were very similar to the descriptions of the lavish palace that ended up in Galland’s version of the Aladdin story. [Therefore, author Paulo Lemos] Horta believes that “Aladdin might be the young Arab Maronite from Aleppo, marveling at the jewels and riches of Versailles.” . . .

For 300 years, scholars thought that the rags-to-riches story of Aladdin might have been inspired by the plots of French fairy tales that came out around the same time, or that the story was invented in that 18th century period as a byproduct of French Orientalism, a fascination with stereotypical exotic Middle Eastern luxuries that was prevalent then. The idea that Diyab might have based it on his own life — the experiences of a Middle Eastern man encountering the French, not vice-versa — flips the script.

[According to Horta,] “Diyab was ideally placed to embody the overlapping world of East and West, blending the storytelling traditions of his homeland with his youthful observations of the wonder of 18th-century France.” . . .

To the scholars who study the tale, its narrative drama isn’t the only reason storytellers keep finding reason to return to Aladdin. It reflects not only “a history of the French and the Middle East, but also [a story about] Middle Easterners coming to Paris and that speaks to our world today,” as Horta puts it. “The day Diyab told the story of Aladdin to Galland, there were riots due to food shortages during the winter and spring of 1708 to 1709, and Diyab was sensitive to those people in a way that Galland is not. When you read this diary, you see this solidarity among the Arabs who were in Paris at the time. . . . There is little in the writings of Galland that would suggest that he was capable of developing a character like Aladdin with sympathy, but Diyab’s memoir reveals a narrator adept at capturing the distinctive psychology of a young protagonist, as well as recognizing the kinds of injustices and opportunities that can transform the path of any youthful adventurer.”

20. All of the following serve as evidence for the character of Aladdin being based on Hanna Diyab EXCEPT:
- Diyab’s cosmopolitanism and cross-cultural experience.
  - Diyab’s humble origins and class struggles, as recounted in his travelogue.
  - Diyab’s narration of the original story to Galland.
  - Diyab’s description of the wealth of Versailles in his travelogue.
21. Which of the following is the primary reason for why storytellers are still fascinated by the story of Aladdin?
- The story of Aladdin is evidence of the eighteenth century French Orientalist attitude.
  - The traveller’s experience that inspired the tale of Aladdin resonates even today.
  - The tale of Aladdin documents the history of Europe and Middle East.
  - The archetype of the rags-to-riches story of Aladdin makes it popular even today.
22. The author of the passage is most likely to agree with which of the following explanations for the origins of the story of Aladdin?
- Basing it on his own life experiences, Diyab transmitted the story of Aladdin to Galland who included it in Arabian Nights.
  - Galland received the story of Aladdin from Diyab who, in turn, found it in an incomplete medieval manuscript.
  - The story of Aladdin has its origins in an undiscovered, incomplete manuscript of a medieval Arabic collection of stories.
  - Galland derived the story of Aladdin from Diyab’s travelogue in which he recounts his fascination with the wealth of Versailles.

23. Which of the following does not contribute to the passage's claim about the authorship of Aladdin?
- The depiction of the affluence of Versailles in Diyab's travelogue.
  - The narrative sensibility of Diyab's travelogue.
  - The story-line of many French fairy tales of the 18th century
  - Galland's acknowledgment of Diyab in his diary.
24. Which of the following, if true, would invalidate the inversion that the phrase "flips the script" refers to?
- Galland acknowledged in the published translations of Arabian Nights that he heard the story of Aladdin from Diyab.
  - Diyab's travelogue described the affluence of the French city of Bordeaux, instead of Versailles.
  - The French fairy tales of the eighteenth century did not have rags-to-riches plot lines like that of the tale of Aladdin.
  - The description of opulence in Hanna Diyab's and Antoine Galland's narratives bore no resemblance to each other.

**DIRECTION (Q. 25):** *The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.*

25. (a) If you've seen a little line of text on websites that says something like "customers who bought this also enjoyed that" you have experienced this collaborative filtering firsthand.
- (b) The problem with these algorithms is that they don't take into account a host of nuances and circumstances that might interfere with their accuracy.
- (c) If you just bought a gardening book for your cousin, you might get a flurry of links to books about gardening, recommended just for you! – the algorithm has no way of knowing you hate gardening and only bought the book as a gift.
- (d) Collaborative filtering is a mathematical algorithm by which correlations and co-occurrences of behaviors are tracked and then used to make recommendations.

**DIRECTION (Q. 26):** *Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.*

26. (a) His idea to use sign language was not a completely new idea as Native Americans used hand gestures to communicate with other tribes.
- (b) Ancient Greek philosopher Aristotle, for example, observed that men who are deaf are incapable of speech.
- (c) People who were born deaf were denied the right to sign a will as they were "presumed to understand nothing; because it is not possible that they have been able to learn to read or write."

- (d) Pushback against this prejudice began in the 16th century when Pedro Ponce de León created a formal sign language for the hearing impaired.
- (e) For millennia, people with hearing impairments encountered marginalization because it was believed that language could only be learned by hearing the spoken word.

**DIRECTION (Q. 27):** *Five sentences related to a topic are given below in a jumbled order. Four of them form a coherent and unified paragraph. Identify the odd sentence that does not go with the four. Key in the number of the option that you choose.*

27. (a) 'Stat' signaled something measurable, while 'matic' advertised free labour; but 'tron', above all, indicated control.
- (b) It was a totem of high modernism, the intellectual and cultural mode that decreed no process or phenomenon was too complex to be grasped, managed and optimized.
- (c) Like the heraldic shields of ancient knights, these morphemes were painted onto the names of scientific technologies to proclaim one's history and achievements to friends and enemies alike.
- (d) The historian Robert Proctor at Stanford University calls the suffix '-tron', along with '-matic' and '-stat', embodied symbols.
- (e) To gain the suffix was to acquire a proud and optimistic emblem of the electronic and atomic age.

**DIRECTION (Q. 28):** *The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.*

28. (a) People with dyslexia have difficulty with print-reading, and people with autism spectrum disorder have difficulty with mind-reading.
- (b) An example of a lost cognitive instinct is mind-reading: our capacity to think of ourselves and others as having beliefs, desires, thoughts and feelings.
- (c) Mind-reading looks increasingly like literacy, a skill we know for sure is not in our genes, since scripts have been around for only 5,000-6,000 years.
- (d) Print-reading, like mind-reading varies across cultures, depends heavily on certain parts of the brain, and is subject to developmental disorders.

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

Physics is a pure science that seeks to understand the behavior of matter without regard to whether it will afford any practical benefit. Engineering is the correlative applied science in which physical theories are put to some specific use, such as building a bridge or a nuclear reactor. Engineers obviously rely heavily on the discoveries of physicists, but an engineer's knowledge of the world is not the same as the

physicist's knowledge. In fact, an engineer's know-how will often depend on physical theories that, from the point of view of pure physics, are false. There are some reasons for this. First, theories that are false in the purest and strictest sense are still sometimes very good approximations to the true ones, and often have the added virtue of being much easier to work with. Second, sometimes the true theories apply only under highly idealized conditions which can only be created under controlled experimental situations. The engineer finds that in the real world, theories rejected by physicists yield more accurate predictions than the ones that they accept.

- (a) The relationship between pure and applied science is strictly linear, with the pure science directing applied science, and never the other way round.
- (b) Though engineering draws heavily from pure science, it contributes to knowledge, by incorporating the constraints and conditions in the real world.
- (c) The unique task of the engineer is to identify, understand, and interpret the design constraints to produce a successful result.
- (d) Engineering and physics fundamentally differ on matters like building a bridge or a nuclear reactor.

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

A distinguishing feature of language is our ability to refer to absent things, known as displaced reference. A speaker can bring distant referents to mind in the absence of any obvious stimuli. Thoughts, not limited to the here and now, can pop into our heads for unfathomable reasons. This ability to think about distant things necessarily precedes the ability to talk about them. Thought precedes meaningful referential communication. A prerequisite for the emergence of human-like meaningful symbols is that the mental categories they relate to can be invoked even in the absence of immediate stimuli.

- (a) Thoughts are essential to communication and only humans have the ability to think about objects not present in their surroundings.
- (b) The ability to think about objects not present in our environment precedes the development of human communication.
- (c) Displaced reference is particular to humans and thoughts pop into our heads for no real reason.
- (d) Thoughts precede all speech acts and these thoughts pop up in our heads even in the absence of any stimulus.

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

Vance Packard's *The Hidden Persuaders* alerted the public

to the psychoanalytical techniques used by the advertising industry. Its premise was that advertising agencies were using depth interviews to identify hidden consumer motivations, which were then used to entice consumers to buy goods. Critics and reporters often wrongly assumed that Packard was writing mainly about subliminal advertising. Packard never mentioned the word subliminal, however, and devoted very little space to discussions of "subthreshold" effects. Instead, his views largely aligned with the notion that individuals do not always have access to their conscious thoughts and can be persuaded by supraliminal messages without their knowledge.

- (a) Packard argued that advertising as a 'hidden persuasion' understands the hidden motivations of consumers and works at the subliminal level, on the subconscious level of the awareness of the people targeted.
- (b) Packard argued that advertising as a 'hidden persuasion' works at the supraliminal level, wherein the people targeted are aware of being persuaded, after understanding the hidden motivations of consumers and works.
- (c) Packard held that advertising as a 'hidden persuasion' builds on peoples' conscious thoughts and awareness, by understanding the hidden motivations of consumers and works at the subliminal level.
- (d) Packard held that advertising as a 'hidden persuasion' understands the hidden motivations of consumers and works at the supraliminal level, though the people targeted have no awareness of being persuaded.

**DIRECTION (Q. 32):** The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.

32. (a) Metaphors may map to similar meanings across languages, but their subtle differences can have a profound effect on our understanding of the world.
- (b) Latin scholars point out *carpe diem* is a horticultural metaphor that, particularly seen in the context of its source, is more accurately translated as "plucking the day," evoking the plucking and gathering of ripening fruits or flowers, enjoying a moment that is rooted in the sensory experience of nature, unrelated to the force implied in seizing.
- (c) The phrase *carpe diem*, which is often translated as "seize the day and its accompanying philosophy, has gone on to inspire countless people in how they live their lives and motivates us to see the world a little differently from the norm.
- (d) It's an example of one of the more telling ways that we mistranslate metaphors from one language to another, revealing in the process our hidden assumptions about what we really value.

**DIRECTION (Q. 33):** The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.

33. (a) We'll all live under mob rule until then, which doesn't help anyone.  
 (b) Perhaps we need to learn to condense the feedback we receive online so that 100 replies carry the same weight as just one.  
 (c) As we grow more comfortable with social media conversations being part of the way we interact every day, we are going to have to learn how to deal with legitimate criticism.  
 (d) A new norm will arise where it is considered unacceptable to reply with the same point that dozens of others have already.

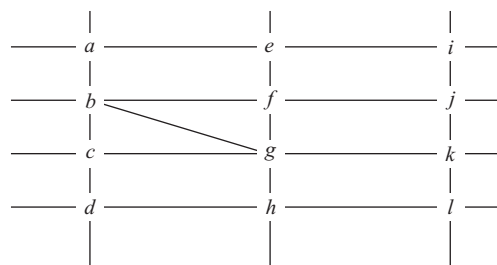
**DIRECTION (Q. 34):** Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

34. (a) One argument is that actors that do not fit within a single, well-defined category may suffer an "illegitimacy discount".  
 (b) Others believe that complex identities confuse audiences about an organization's role or purpose.  
 (c) Some organizations have complex and multidimensional identities that span or combine categories, while other organizations possess narrow identities.  
 (d) Identity is one of the most important features of organizations, but there exist opposing views among sociologists about how identity affects organizational performance.  
 (e) Those who think that complex identities are beneficial point to the strategic advantages of ambiguity, and organizations' potential to differentiate themselves from competitors.

## SECTION : DI & REASONING

**DIRECTIONS (Qs. 35-38):** Go through the graph and the information given below and answer the question that follows.

The figure below shows the street map for a certain region with the street intersections marked from a through l. A person standing at an intersection can see along straight lines to other intersections that are in her line of sight and all other people standing at these intersections. For example, a person standing at intersection g can see all people standing at intersections b, c, e, f, h, and k. In particular, the person standing at intersection g can see the person standing at intersection e irrespective of whether there is a person standing at intersection f.



Six people U, V, W, X, Y, and Z, are standing at different intersections. No two people are standing at the same intersection.

The following additional facts are known.

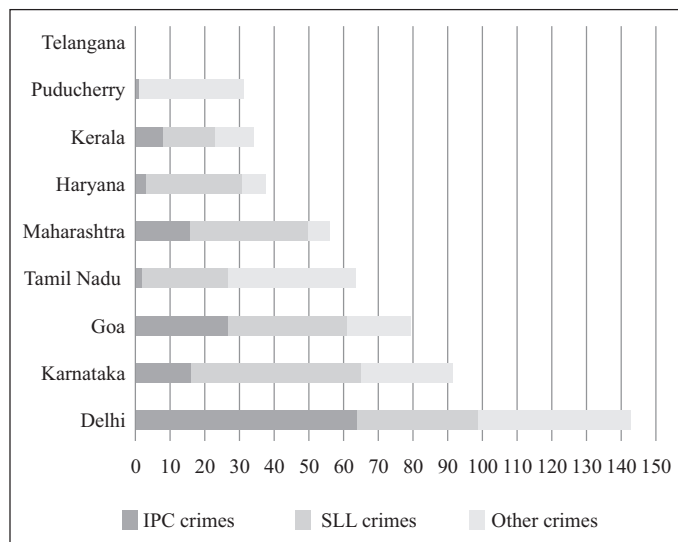
- X, U, and Z are standing at the three corners of a triangle formed by three street segments.
  - X can see only U and Z.
  - Y can see only U and W.
  - U sees V standing in the next intersection behind Z.
  - W cannot see V or Z.
  - No one among the six is standing at intersection d.
35. Who is standing at intersection a?  
 (a) V (b) Y  
 (c) No one (d) W
36. Who can V see?  
 (a) U, W and Z only (b) U only  
 (c) Z only (d) U and Z only
37. What is the minimum number of street segments that X must cross to reach Y?  
 (a) 1 (b) 4  
 (c) 2 (d) 3
38. Should a new person stand at intersection d, who among the six would she see?  
 (a) U and W only (b) V and X only  
 (c) W and X only (d) U and Z only

**DIRECTIONS (Qs. 39-42):** Go through the graph and the information given below and answer the question that follows.

The Ministry of Home Affairs is analysing crimes committed by foreigners in different states and union territories (UT) of India. All cases refer to the ones registered against foreigners in 2016.

The number of cases – classified into three categories: IPC crimes, SLL crimes and other crimes – for nine states/UTs are shown in the figure below. These nine belong to the top ten states/UTs in terms of the total number of cases registered. The remaining state (among top ten) is West Bengal, where all the 520 cases registered were SLL crimes.





The table below shows the ranks of the ten states/UTs mentioned above among ALL states/UTs of India in terms of the number of cases registered in each of the three category of crimes. A state/UT is given rank  $r$  for a category of crimes if there are  $(r-1)$  states/UTs having a larger number of cases registered in that category of crimes. For example, if two states have the same number of cases registered in the same category, and exactly three other states/UTs have larger numbers of cases registered in the same category, then both the states are given rank 4 in that category. Missing ranks in the table are denoted by \*.

	IPC crimes	SLL crimes	Other crimes
Delhi	*	*	*
Goa	*	4	*
Haryana	8	6	*
Karnataka	3	2	*
Kerala	*	9	*
Maharashtra	3	4	8
Puducherry	13	29	*
Tamil Nadu	11	7	*
Telangana	6	9	8
West Bengal	17	*	16

39. What is the rank of Kerala in the 'IPC crimes' category?
40. In the two states where the highest total number of cases are registered, the ratio of the total number of cases in IPC crimes to the total number in SLL crimes is closest to  
 (a) 3:2 (b) 19:20  
 (c) 1:9 (d) 11:10
41. Which of the following is DEFINITELY true about the ranks of states/UT in the 'other crimes' category?  
 (i) Tamil Nadu: 2  
 (ii) Puducherry: 3  
 (a) neither (i), nor (ii) (b) only (ii)  
 (c) only (i) (d) both (i) and (ii)

42. What is the sum of the ranks of Delhi in the three categories of crimes?

**DIRECTIONS (Qs. 43-46):** Read the information given below and answer the question that follows.

A supermarket has to place 12 items (coded A to L) in shelves numbered 1 to 16. Five of these items are types of biscuits, three are types of candies and the rest are types of savouries. Only one item can be kept in a shelf. Items are to be placed such that all items of same type are clustered together with no empty shelf between items of the same type and at least one empty shelf between two different types of items. At most two empty shelves can have consecutive numbers.

The following additional facts are known.

- A and B are to be placed in consecutively numbered shelves in increasing order.
  - I and J are to be placed in consecutively numbered shelves both higher numbered than the shelves in which A and B are kept.
  - D, E and F are savouries and are to be placed in consecutively numbered shelves in increasing order after all the biscuits and candies.
  - K is to be placed in shelf number 16.
  - L and J are items of the same type, while H is an item of a different type.
  - C is a candy and is to be placed in a shelf preceded by two empty shelves.
  - L is to be placed in a shelf preceded by exactly one empty shelf.
43. In how many different ways can the items be arranged on the shelves?  
 (a) 4 (b) 8  
 (c) 2 (d) 1
44. Which of the following items is not a type of biscuit?  
 (a) B (b) A  
 (c) G (d) L
45. Which of the following can represent the numbers of the empty shelves in a possible arrangement?  
 (a) 1, 7, 11, 12 (b) 1, 2, 6, 12  
 (c) 1, 2, 8, 12 (d) 1, 5, 6, 12
46. Which of the following statements is necessarily true?  
 (a) There are at least four shelves between items B and C.  
 (b) All biscuits are kept before candies.  
 (c) All candies are kept before biscuits.  
 (d) There are two empty shelves between the biscuits and the candies.

**DIRECTIONS (Qs. 47-50):** Read the information given below and answer the question that follows.

A new game show on TV has 100 boxes numbered 1, 2, ..., 100 in a row, each containing a mystery prize. The prizes are items of different types, a, b, c, ..., in decreasing order of value. The most expensive item is of type a, a diamond ring, and there is



exactly one of these. You are told that the number of items at least doubles as you move to the next type. For example, there would be at least twice as many items of type b as of type a, at least twice as many items of type c as of type b and so on. There is no particular order in which the prizes are placed in the boxes.

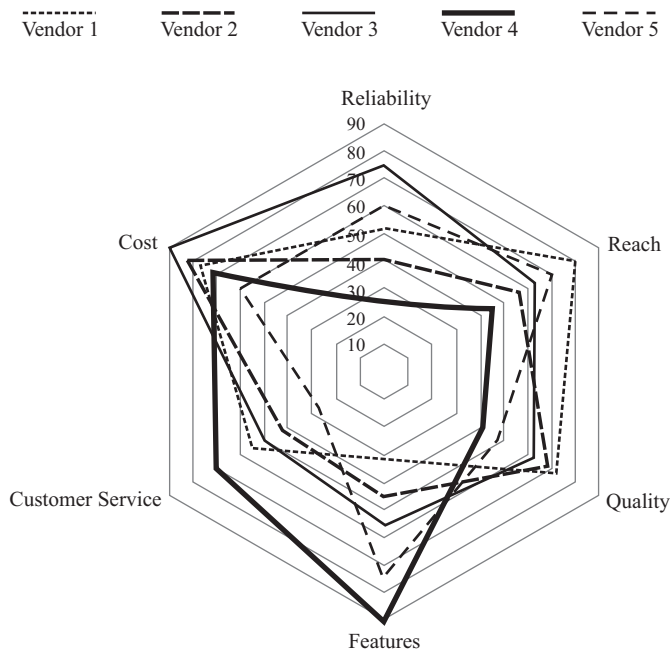
47. What is the minimum possible number of different types of prizes?
48. What is the maximum possible number of different types of prizes?
49. Which of the following is not possible?
- There are exactly 75 items of type e.
  - There are exactly 45 items of type c.
  - There are exactly 60 items of type d.
  - There are exactly 30 items of type b.
50. You ask for the type of item in box 45. Instead of being given a direct answer, you are told that there are 31 items of the same type as box 45 in boxes 1 to 44 and 43 items of the same type as box 45 in boxes 46 to 100.

What is the maximum possible number of different types of items?

- 6
- 3
- 5
- 4

**DIRECTIONS (Qs. 51-54):** Read the information given below and answer the question that follows.

Five vendors are being considered for a service. The evaluation committee evaluated each vendor on six aspects – Cost, Customer Service, Features, Quality, Reach, and Reliability. Each of these evaluations are on a scale of 0 (worst) to 100 (perfect). The evaluation scores on these aspects are shown in the radar chart. For example, Vendor 1 obtains a score of 52 on Reliability, Vendor 2 obtains a score of 45 on Features and Vendor 3 obtains a score of 90 on Cost.



51. On which aspect is the median score of the five vendors the least?
- Customer Service
  - Cost
  - Quality
  - Reliability
52. A vendor's final score is the average of their scores on all six aspects. Which vendor has the highest final score?
- Vendor 1
  - Vendor 2
  - Vendor 4
  - Vendor 3
53. List of all the vendors who are among the top two scorers on the maximum number of aspects is:
- Vendor 2, Vendor 3 and Vendor 4
  - Vendor 1 and Vendor 5
  - Vendor 1 and Vendor 2
  - Vendor 2 and Vendor 5
54. List of all the vendors who are among the top three vendors on all six aspects is:
- None of the Vendors
  - Vendor 1
  - Vendor 3
  - Vendor 1 and Vendor 3

**DIRECTIONS (Qs. 55-58):** Read the information given below and answer the question that follows.

The following table represents addition of two six-digit numbers given in the first and the second rows, while the sum is given in the third row. In the representation, each of the digits 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 has been coded with one letter among A, B, C, D, E, F, G, H, J, K, with distinct letters representing distinct digits.

		B	H	A	A	G	F
+		A	H	J	F	K	F
	A	A	F	G	C	A	F

55. Which digit does the letter A represent?
56. Which digit does the letter B represent?
57. Which among the digits 3, 4, 6 and 7 cannot be represented by the letter D?
58. Which among the digits 4, 6, 7 and 8 cannot be represented by the letter G?

**DIRECTIONS (Qs. 59-62):** Read the information given below and answer the question that follows.

Six players – Tanzi, Umeza, Wangdu, Xyla, Yonita and Zeneca competed in an archery tournament. The tournament had three compulsory rounds, Rounds 1 to 3. In each round every player shot an arrow at a target. Hitting the centre of the target (called bull's eye) fetched the highest score of 5. The only other possible scores that a player could achieve were 4, 3, 2 and 1. Every bull's eye score in the first three rounds gave a player one additional chance to shoot in the bonus rounds, Rounds 4 to 6. The possible scores in Rounds 4 to 6 were identical to the first three.

A player's total score in the tournament was the sum of his/her scores in all rounds played by him/her. The table below presents partial information on points scored by the players after

completion of the tournament. In the table, NP means that the player did not participate in that round, while a hyphen means that the player participated in that round and the score information is missing.

	Round-1	Round-2	Round-3	Round-4	Round-5	Round-6
Tanzi	-	4	-	5	NP	NP
Umeza	-	-	-	1	2	NP
Wangdu	-	4	-	NP	NP	NP
Xyla	-	-	-	1	5	-
Yonita	-	-	3	5	NP	NP
Zeneca	-	-	-	5	5	NP

The following facts are also known.

1. Tanzi, Umeza and Yonita had the same total score.
  2. Total scores for all players, except one, were in multiples of three.
  3. The highest total score was one more than double of the lowest total score.
  4. The number of players hitting bull's eye in Round 2 was double of that in Round 3.
  5. Tanzi and Zeneca had the same score in Round 1 but different scores in Round 3.
59. What was the highest total score?
- (a) 24 (b) 21  
(c) 23 (d) 25
60. What was Zeneca's total score?
- (a) 23 (b) 24  
(c) 21 (d) 22
61. Which of the following statements is true?
- (a) Xyla's score was 23.  
(b) Xyla was the highest scorer.  
(c) Zeneca was the highest scorer.  
(d) Zeneca's score was 23.
62. What was Tanzi's score in Round 3?
- (a) 3 (b) 5  
(c) 4 (d) 1

**DIRECTIONS (Qs. 63-66):** Read the information given below and answer the question that follows.

Princess, Queen, Rani and Samraghi were the four finalists in a dance competition. Ashman, Badal, Gagan and Dyu were the four music composers who individually assigned items to the dancers. Each dancer had to individually perform in two dance items assigned by the different composers. The first items performed by the four dancers were all assigned by different music composers. No dancer performed her second item before the performance of the first item by any other dancers. The dancers performed their second items in the same sequence of their performance of their first items.

The following additional facts are known.

- (i) No composer who assigned item to Princess, assigned any item to Queen.
  - (ii) No composer who assigned item to Rani, assigned any item to Samraghi.
  - (iii) The first performance was by Princess; this item was assigned by Badal.
  - (iv) The last performance was by Rani; this item was assigned by Gagan.
  - (v) The items assigned by Ashman were performed consecutively. The number of performances between items assigned by each of the remaining composers was the same.
63. Which of the following is true?
- (a) The second performance was composed by Dyu.  
(b) The third performance was composed by Ashman.  
(c) The second performance was composed by Gagan.  
(d) The third performance was composed by Dyu.
64. Which of the following is FALSE?
- (a) Samraghi did not perform in any item composed by Ashman.  
(b) Princess did not perform in any item composed by Dyu.  
(c) Queen did not perform in any item composed by Gagan.  
(d) Rani did not perform in any item composed by Badal.
65. The sixth performance was composed by:
- (a) Badal (b) Ashman  
(c) Dyu (d) Gagan
66. Which pair of performances were composed by the same composer?
- (a) The second and the sixth  
(b) The first and the seventh  
(c) The third and the seventh  
(d) The first and the sixth

### SECTION: QUANTITATIVE ABILITY

67. If  $(5.55)^x = (0.555)^y = 1000$ , then the value of  $\frac{1}{x} - \frac{1}{y}$  is

- (a)  $\frac{2}{3}$  (b)  $\frac{1}{3}$   
(c) 1 (d) 3

68. Corners are cut off from an equilateral triangle  $T$  to produce a regular hexagon  $H$ .

Then, the ratio of the area of  $H$  to the area of  $T$  is

- (a) 2 : 3 (b) 3 : 4  
(c) 4 : 5 (d) 5 : 6

69. Let  $S$  be the set of all points  $(x, y)$  in the  $x$ - $y$  plane such that  $|x| + |y| \leq 2$  and  $|x| \geq 1$ . Then, the area (in square units) of the region represented by  $S$  equals

70. If  $a_1 + a_2 + a_3 + \dots + a_n = 3(2^{n+1} - 2)$ , for every  $n \geq 1$ , then  $a_{11}$  equals

71. If  $a_1, a_2, \dots$  are in A.P., then,  $\frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \dots + \frac{1}{\sqrt{a_n} + \sqrt{a_{n+1}}}$  is equal to
- (a)  $\frac{n-1}{\sqrt{a_1} + \sqrt{a_{n-1}}}$  (b)  $\frac{n-1}{\sqrt{a_1} + \sqrt{a_n}}$   
 (c)  $\frac{n}{\sqrt{a_1} + \sqrt{a_{n+1}}}$  (d)  $\frac{n}{\sqrt{a_1} + \sqrt{a_n}}$
72.  $AB$  is a diameter of a circle of radius 5 cm. Let  $P$  and  $Q$  be two points on the circle so that the length of  $PB$  is 6 cm, and the length of  $AP$  is twice that of  $AQ$ . Then the length, in cm, of  $QB$  is nearest to
- (a) 9.1 (b) 7.8  
 (c) 9.3 (d) 8.5
73. Ramesh and Gautam are among 22 students who write an examination. Ramesh scores 82.5. The average score of the 21 students other than Gautam is 62. The average score of all the 22 students is one more than the average score of the 21 students other than Ramesh. The score of Gautam is
- (a) 49 (b) 51  
 (c) 48 (d) 53
74. One can use three different transports which move at 10, 20, and 30 kmph, respectively. To reach from  $A$  to  $B$ , Amal took each mode of transport  $1/3$  of his total journey time, while Bimal took each mode of transport  $1/3$  of the total distance. The percentage by which Bimal's travel time exceeds Amal's travel time is nearest to
- (a) 22 (b) 20  
 (c) 19 (d) 21
75. If the rectangular faces of a brick have their diagonals in the ratio  $3 : 2\sqrt{3} : \sqrt{15}$ , then the ratio of the length of the shortest edge of the brick to that of its longest edge is
- (a)  $1 : \sqrt{3}$  (b)  $\sqrt{3} : 2$   
 (c)  $\sqrt{2} : \sqrt{3}$  (d)  $2 : \sqrt{5}$
76. Two cars travel the same distance starting at 10:00 am and 11:00 am, respectively, on the same day. They reach their common destination at the same point of time. If the first car travelled for at least 6 hours, then the highest possible value of the percentage by which the speed of the second car could exceed that of the first car is
- (a) 10 (b) 20  
 (c) 30 (d) 25
77. Amala, Bina, and Gouri invest money in the ratio 3 : 4 : 5 in fixed deposits having respective annual interest rates in the ratio 6 : 5 : 4. What is their total interest income (in Rs) after a year, if Bina's interest income exceeds Amala's by ₹ 250?
- (a) 6000 (b) 7250  
 (c) 6350 (d) 7000
78. In a race of three horses, the first beat the second by 11 metres and the third by 90 metres. If the second beat the third by 80 metres, what was the length, in metres, of the racecourse?
79. Meena scores 40% in an examination and after review, even though her score is increased by 50%, she fails by 35 marks. If her post-review score is increased by 20%, she will have 7 marks more than the passing score. The percentage score needed for passing the examination is
- (a) 75 (b) 60  
 (c) 80 (d) 70
80. The wheels of bicycles  $A$  and  $B$  have radii 30 cm and 40 cm, respectively. While traveling a certain distance, each wheel of  $A$  required 5000 more revolutions than each wheel of  $B$ . If bicycle  $B$  traveled this distance in 45 minutes, then its speed, in km per hour, was
- (a)  $16\pi$  (b)  $12\pi$   
 (c)  $18\pi$  (d)  $14\pi$
81. A chemist mixes two liquids 1 and 2. One litre of liquid 1 weighs 1 kg and one litre of liquid 2 weighs 800 gm. If half litre of the mixture weighs 480 gm, then the percentage of liquid 1 in the mixture, in terms of volume, is
- (a) 75 (b) 85  
 (c) 80 (d) 70
82. Let  $x$  and  $y$  be positive real numbers such that  $\log_5(x+y) + \log_5(x-y) = 3$ , and  $\log_2 y - \log_2 x = 1 - \log_2 3$ . Then  $xy$  equals
- (a) 150 (b) 100  
 (c) 250 (d) 25
83. With rectangular axes of coordinates, the number of paths from  $(1, 1)$  to  $(8, 10)$  via  $(4, 6)$ , where each step from any point  $(x, y)$  is either to  $(x, y+1)$  or to  $(x+1, y)$ , is
84. The number of solutions to the equation  $|x|(6x^2 + 1) = 5x^2$  is
85. At their usual efficiency levels,  $A$  and  $B$  together finish a task in 12 days. If  $A$  had worked half as efficiently as she usually does, and  $B$  had worked thrice as efficiently as he usually does, the task would have been completed in 9 days. How many days would  $A$  take to finish the task if she works alone at her usual efficiency?
- (a) 18 (b) 36  
 (c) 24 (d) 12
86. The product of the distinct roots of  $|x^2 - x - 6| = x + 2$  is
- (a) -24 (b) -16  
 (c) -8 (d) -4
87. Let  $T$  be the triangle formed by the straight line  $3x + 5y - 45 = 0$  and the coordinate axes. Let the circumcircle of  $T$  have radius of length  $L$ , measured in the same unit as the coordinate axes. Then, the integer closest to  $L$  is
88. Three men and eight machines can finish a job in half the time taken by three machines and eight men to finish the same job. If two machines can finish the job in 13 days, then how many men can finish the job in 13 days?

89. A person invested a total amount of ₹ 15 lakh. A part of it was invested in a fixed deposit earning 6% annual interest, and the remaining amount was invested in two other deposits in the ratio 2 : 1, earning annual interest at the rates of 4% and 3%, respectively. If the total annual interest income is ₹ 76000 then the amount (in ₹ lakh) invested in the fixed deposit was
90. In a class, 60% of the students are girls and the rest are boys. There are 30 more girls than boys. If 68% of the students, including 30 boys, pass an examination, the percentage of the girls who do not pass is
91. The number of the real roots of the equation  $2\cos(x(x+1)) = 2^x + 2^{-x}$  is  
 (a) 0 (b) 1  
 (c) 2 (d) infinite
92. A club has 256 members of whom 144 can play football, 123 can play tennis, and 132 can play cricket. Moreover, 58 members can play both football and tennis, 25 can play both cricket and tennis, while 63 can play both football and cricket. If every member can play at least one game, then the number of members who can play only tennis is  
 (a) 45 (b) 32  
 (c) 38 (d) 43
93. For any positive integer  $n$ , let  $f(n) = n(n+1)$  if  $n$  is even, and  $f(n) = n+3$  if  $n$  is odd. If  $m$  is a positive integer such that  $8f(m+1) - f(m) = 2$ , then  $m$  equals
94. The product of two positive numbers is 616. If the ratio of the difference of their cubes to the cube of their difference is 157:3, then the sum of the two numbers is  
 (a) 58 (b) 95  
 (c) 85 (d) 50
95. Consider a function  $f$  satisfying  $f(x+y) = f(x)f(y)$  where  $x, y$  are positive integers, and  $f(1) = 2$ . If  $f(a+1) + f(a+2) + \dots + f(a+n) = 16(2^n - 1)$  then  $a$  is equal to
96. The income of Amala is 20% more than that of Bimala and 20% less than that of Kamala. If Kamala's income goes down by 4% and Bimala's goes up by 10%, then the percentage by which Kamala's income would exceed Bimala's is nearest to  
 (a) 29 (b) 28  
 (c) 32 (d) 31
97. In a circle of radius 11 cm,  $CD$  is a diameter and  $AB$  is a chord of length 20.5 cm. If  $AB$  and  $CD$  intersect at a point  $E$  inside the circle and  $CE$  has length 7 cm, then the difference of the lengths of  $BE$  and  $AE$ , in cm, is  
 (a) 1.5 (b) 2.5  
 (c) 3.5 (d) 0.5
98. On selling a pen at 5% loss and a book at 15% gain, Karim gains ₹ 7. If he sells the pen at 5% gain and the book at 10% gain, he gains ₹ 13. What is the cost price of the book in Rupees?  
 (a) 85 (b) 95  
 (c) 80 (d) 100
99. If the population of a town is  $p$  in the beginning of any year then it becomes  $3 + 2p$  in the beginning of the next year. If the population in the beginning of 2019 is 1000, then the population in the beginning of 2034 will be  
 (a)  $(997)2^{14} + 3$  (b)  $(997)^{15} - 3$   
 (c)  $(1003)^{15} + 6$  (d)  $(1003)2^{15} - 3$
100. If  $m$  and  $n$  are integers such that  $(\sqrt{2})^{19} 3^4 4^2 9^m 8^n = 3^n 16^m (\sqrt[4]{64})$  then  $m$  is  
 (a) -16 (b) -20  
 (c) -12 (d) -24

# Hints & Explanations

1. (a) If you read and understand the options carefully you will find the answer. The question is about the causes of plurality and diversity in the British folk tradition. All the options except option (a) have something or the other to say about links of the tradition to the remote past and to diverse faiths etc. For instance, option (b) is "pagan influences from dark ages", the British folk forms coming from the remote past and the option (c) speaks about the fluidity of folk forms coming from history of oral mode of transmission. However, option (a) says that folk forms can be popular or unpopular which has nothing to do with diversity.
  2. (c) Let us move step by step. Option (a) is "the power of folk resides in its contradictory ability to influence and be influenced by the present while remaining rooted in the past." This is clearly the view of the author who describes how folk forms have been used by modern musicians, and appreciates the fusion of folk with other forms of music.  
Further, the author endorses the fact that folk form were not only relevant in the past but also today, which is what precisely author discusses and is the point made in option (b). The author also appears to agree with the fact that "plurality and democratising impulse of folk forms emanate from the improvisation that its practitioners bring to it" which is option (d).  
However, the author may not or is least likely to concur with option (c) because the option says that folk music exhibit unusual homogeneity which contradicts with not only other options but also the point made in the passage that folk music has constantly modified and adopted which means folk music has over the time adapted to changes by changing and modifying which could not be possible if the music exhibited unusual homogeneity.
  3. (c) This question is on why William Morris has been referred to? In the passage there is a sentence: "Just as the effusive floral prints of the radical William Morris now cover genteel sofas, so the revolutionary intentions of many folk historians and revivalists have led to music that is commonly regarded as parochial and conservative." This means what was revolutionary in the past has become common place now. In other words, option (c) also says precisely this: "that what is once regarded as radical in folk, can later be seen as conformist".
  4. (b) If you read the question, you will realize that you are being asked to choose something that cannot be inferred from the passage. Here is the reason why option (b) cannot be inferred from the passage. The sentence relating to folk music in the passage says:  
"In the late 1960s, purists were suspicious of folk songs recast in rock idioms. Electrification, however, comes in many forms."
- From the above sentence, it can be inferred only that electrification comes in many forms. That is to say, electrification need not come through influx of rock music but may come possibly from the influx of music in general. Therefore, option (b) cannot be inferred as something very specific.
- As for the other options, choice (c) is supported by the sentence "...the lyrical freedom of Bob Dylan..." in the passage.
- Option (d) can be inferred because, this option is: "It reinforced Cecil Sharp's observation about folk's constant transformation". In the passage Cecil Sharp talks about folk music's ability to adapt and that adaptation is evident in the music of 40s and 60s. "...the lyrical freedom of Bob Dylan..." this phrase comes in support of choice (c)
- Choice (a) says about music that it was not free from critics, while in the passage we can see that in the late 1960s, Purists were suspicious of folk songs recast in rock idioms, this suggests that it had critics. So, it can be inferred that purists were those critics, which supports choice(a).
5. (d) The use of the word fossilized indicates something about the past and old that it cannot be changed. In all the given options, the closest indication of this word meaning is in option (d): "of its nostalgic association with a pre-industrial past". The other options make no sense.
  6. (a) The author has discussed topophilia throughout but introduced topophobia towards the end in the passage. While philia is love, phobia is fear. The last sentence of the passage makes the sense clear: "And just as a beloved landscape is suddenly revealed, so too may landscapes of fear cast a dark shadow over a place that makes one feel a sense of dread or anxiety—or topophobia". This meaning is evident in option (a) alone: "to represent a feeling of dread towards particular spaces and places"
  7. (a) In this question you have to explain "Topophilia is difficult to design for and impossible to quantify...". The answer to it is found in option (a) because the following sentence from the passage clearly says the reason has to be subjective.  
"Topophilia is difficult to design for and impossible to quantify, and its most articulate interpreters have been self-reflective philosophers such as Henry David Thoreau, evoking a marvelously intricate sense of place at Walden Pond, and Tuan, describing his deep affinity for the desert." Thus subjectivity is clearly indicated in difference is the likes of Thoreau and Walden pond.
  8. (c) This question which appears difficult may be easy to answer if you understand the question well. The



question is “Which of the following statements, if true, could be seen as not contradicting the arguments in the passage?” In other words, the statements in the option may not be true but you have to consider it true and in its true sense it must support the argument in the passage. This approach should be used only when no statement is true. Secondly, a statement in the option may both be true and support the argument in the passage. In that case, it should be your preferred answer.

So let us move methodically.

Option (a): According to the option tactile and olfactory response is the most important factor, while according to the passage it is the third most important factor.

Option (b): According to this option: “Generally speaking, in a given culture, the ties of the people to their environment vary little in significance or intensity.” But according to the passage, “the emotive ties with the material environment vary greatly from person to person”.

Option (c) According to this option: “Patriotism, usually seen as a positive feeling, is presented by the author as a darker form of topophilia”. And the passage endorses this in the sentence: “Topophilia connotes a positive relationship, but it often is useful to explore the darker affiliations between people and place”.

Option (a) contradicts because the author says that olfactory response is the third most important factor, while the option says that it is the most important factor.

Option (b) also can be ruled out because the author says in the first paragraph: the emotive ties with the material environment vary greatly from person to person and in intensity, subtlety, and mode of expression. The author says ‘vary greatly’, while the option says ‘vary little’

Option (c) can be seen in the last paragraph, and is parallel to what the author has to say. This is not contradicting the author’s argument, and hence it is the right choice.

Option (d) can be ruled out because it too goes against what the author has to say.

“Most notably, new urbanism seeks to counter the perceived placelessness of modern suburbs and the decline of central cities through neo-traditional design motifs. Although motivated by good intentions, such attempts to create places rich in meaning are perhaps bound to disappoint”

The author says the New Urbanism is bound to disappoint, but the options says that it is successful as the client’s demand for it.

9. (a) Author’s understanding of Topophilia is clearly mentioned towards the end of the passage which is not different from dictionary meaning that is love of a place. In the options this sense is only reflected in option (a). Option (b) is clearly incorrect because topophilia cannot be the least affinity for a place. It cannot either be option (c) because patriotism is a characteristic of topophilia and the French being not overly patriotic do not display topophilia. The fourth

option may be correct but it is not closer in meaning than option (a). Moreover, option (a) explains what is topophilia while the option (d) does not.

10. (b) Read the following sentence from the passage: “Residents of upscale residential developments have disclosed how important it is to maintain their community’s distinct identity, often by casting themselves in a superior social position and by reinforcing class and racial differences.”

This sentence makes it absolutely clear that “Residents of upscale residential developments” that residents practice social exclusivism as an approach to their class or racial superiority as also pointed out in the option (b).

11. (b) Something very specific is being asked here, that is, which of the given options sums up the overall purpose of the examples of Casper and Glossier in the passage. As you read the passage, you will come across statements/sentences related to Casper and Glossier as follows:

“Casper (mattresses), Glossier (makeup), Away (suitcases), and many others have sprouted up to offer consumers freedom from choice”

“For start-ups that promise accessible simplicity, their very structure still might eventually push them toward overwhelming variety.”

“Casper has expanded into bedroom furniture and bed linens. Glossier, after years of marketing itself as no-makeup makeup that requires little skill to apply, recently launched a full line of glittering color cosmetics.”

The overall sense of these statements we get is that of something similar expressed in option (b). This is: “They might transform into what they were exceptions to.”

12. (b) The author uses the phrase ‘choice fatigue’ which means the author would want limited choice. Secondly, the author appears to favour mid-range price: “The companies have a few aesthetically pleasing and supposedly highly functional options, usually at mid-range prices.” Out of the given options, options (b) and (c) would fit better into the author’s preference and between (b) and (c), the second choice is better because the price range is more favourable in the mid range price. (b). A range of 10 products priced between 5 and 10. (c). A range of 10 products priced between 10 and 25). Therefore, option (b) is the most preferred choice.

13. (b) When you are asked a question relating to inference that can be made from the passage, you may have to read the entire passage. Alternatively, read the options to identify what cannot be inferred from the passage. Let us go one by one.

The first option is: (a). too many options have made it difficult for consumers to trust products. This is certainly the inference that is there in the passage: “Casper (mattresses), Glossier (makeup), Away (suitcases), and many others have sprouted up to offer consumers freedom from choice: The companies have

a few aesthetically pleasing and supposedly highly functional options, usually at mid-range prices.

The second option is: (b) consumers tend to prefer products by start-ups over those by established companies. We do not see an inference matching this, so this could be the possible answer but we may like to check the other options as well.

The third option is: (c) having too many product options can be overwhelming for consumers.

This inference can be easily arrived at if we read the following in the passage: "Helping consumers figure out what to buy amid an endless sea of choice online has become a cottage industry unto itself. Many brands and retailers now wield marketing buzzwords such as curation, differentiation, and discovery as they attempt to sell an assortment of stuff targeted to their ideal customer. Companies find such shoppers through the data gold mine of digital advertising, which can catalog people by gender, income level, personal interests, and more. Since Americans have lost the ability to sort through the sheer volume of the consumer choices available to them..."

The fourth option is: (d) consumers are susceptible to marketing images that they see on social media. Now go through the following in the passage: "choice fatigue is one reason so many people gravitate toward lifestyle influencers on Instagram—the relentlessly chic young moms and perpetually vacationing 20-somethings—who present an aspirational worldview, and then recommend the products and services that help achieve it. . . ."

The extract clearly suggests that customers are susceptible (influenced by) to marketing images on the social media (Instagram).

Therefore, option (b) is the correct answer.

14. (c) Let us understand the question. The given options are a list of hypothetical statements, while the question asks you identify the statement that would add least depth to the author's prediction of the fate of start-ups offering few product options.

Towards the end of the passage, the author makes a claim that the start-ups will start offering a greater number of choices under the pressure to generate revenue. He cites the example of Casper and Glossier. Option (a) clearly says that Casper and Glossier have added more product ranges. In other words, it adds depth to that prediction. So we can eliminate this choice. Option (b) also adds some depth to the prediction with their assertion that start-ups with few products are not an exception to the American consumer market. There is thus the implication that they should have more products otherwise they will fail.

Option (c) can be easily said to provide the least depth to the author's prediction. This option reads: "An exponential surge in their sales enables start-ups to meet their desired profit goals without expanding

their product catalogue". This statement gives the least depth to author's prediction because it claims to meet the goals of the start-ups without expanding their product catalogue.

Option (d) discusses about doubling the rate of taxation for start-ups. This may likely cause problems for them and they may likely fail. In other words, it also gives some depth to author's prediction about start-ups with limited product range.

15. (b) According to question, all the options except one would weaken author's claims. You have to identify the option that would strengthen or not affect the author's claim.

Option (a) Product options increased market competition, bringing down the prices of commodities, which, in turn, increased purchasing power of the poor. This option speaks in favour of giving greater product options to customers. This would weaken author's argument who argues against overwhelming choice.

Option (b) The annual sales growth of companies with fewer product options were higher than that of companies which curated their products for target consumers. This option appears to support the stand of the author who is in favour of offering limited choices to customers. This option shows that offering fewer product can bring positive results. Therefore, option (b) does not weaken the argument of the author but supports it on contrary. So it should be the right choice. Option (c) The empowerment felt by purchasers in buying a commodity were directly proportional to the number of options they could choose from. In other words, the implication of this option is that greater the number of options or larger the choices the more empowered is the buyers. This weakens author's argument for lesser number of choices.

Option (d) The annual sale of companies that hired lifestyle influencers on Instagram for marketing their products were 40% less than those that did not. According to this argument, going to the social media did not help the business

Choice (d) goes out because people go to Instagram because they are overwhelmed with choices. If that fails (as the sales are 40 percent less) it will weaken the author's argument.

Choice (a) speaks in favour of giving greater product options to customers. Choice (c) too does the same thing.

16. (a) In order to answer this question, you will have to find the sentence in which the word "paradox" has been used. This sentence in the passage is as follows: "...by keeping their outer surface below air temperature, the birds might paradoxically be able to draw very slight amounts of heat from the air around them..."

The meaning of paradox means something that appears contradictory but may not be actually so. In the given context, it is a paradox that by keep your outer surface of the body cold, you are trying to draw heat from the

air around your body. The first option says precisely this: Keeping a part of their body colder helps penguins keep their bodies warmer.

The second option is "Heat loss through radiation happens despite the heat gain through convection." There is no paradox in it. It merely says heat loss and heat gain processes are taking place. In the same way, the other options also do not appear paradoxical. Option (c) might create some confusion. Option (c) is "Keeping their body colder helps penguins keep their plumage warmer." But in this option, keeping their plumage warmer does not help them keep their body warmer as the context of the passage is about keeping their bodies warmer. So we will have to reject this option. Therefore, option (a) is the correct answer.

17. (b) According to the question, all the options (considering they are true) negate the findings of the study but there is one option that does not negate the findings. Therefore, we can go to each of the options one by one to find out whether they contradict the points made in the passage or not.

The passage maintains that the outer air temperature is warmer than the plumage temperature. In contrast if the outer temperature gets colder than the plumage temperature, the point made in the passage which is the findings of the study would be negated and this position is taken by option (a) because the heat transfer from colder air outside to the warmer plumage will not take place. Therefore, we can reject option (a).

Now let us come to choice (a). In choice (c), the plumage is warmer than the outer air of Antarctic, while the plumage has to be colder. Therefore, it negates the finding of the study in the passage. So this choice has to be rejected.

Choice (d) is about penguins' plumage made of a material that did not allow any heat transfer through convection or radiation. But in the passage thermal convection helps the penguins gain some heat. Therefore, this option negates the findings of the study or the contention of the author of the passage.

However option (b) does not negate the finding of the study. The passage claims that the feet is the warmest part of the body and if you make it a little warmer, it is still the warmest part of the body. Option (b) correctly describes the average temperature of the feet of penguins in the month of June 2008. This does not negate the finding of the study. Hence, it is the correct answer.

18. (b) The question refers to the paragraph 3 as already mentioned in the passage. It is about the last sentence in the third paragraph. The following is the last sentence: "As the cold Antarctic air cycles around their bodies, slightly warmer air comes into contact with the plumage and donates minute amounts of heat back to the penguins, then cycles away at a slightly colder temperature." You have to identify the correct reference or context of slightly warmer air and slightly colder temperature from the given options.

Option (a) is not the right or correct reference because it discusses about air inside the penguins' bodies, while the last sentence is about the external air.

Option (b) makes some sense. Therefore, we will keep this option aside for a while as we examine the other options.

It is known that the cold Antarctic's air temperature is higher than that of the plumage so the slightly warmer air that comes in contact with the plumage. The air is coming from outside because it is maintained that cold Antarctic air is cycling around their bodies so the air has to be outside. Both options (a) and (c) discuss about air inside the plumage. Therefore, these two options are eliminated. We are left with option (d) now. Let us examine this option. This option can be eliminated because this option talks about "the cold Antarctic air which becomes warmer because of the heat radiated out from penguins' bodies" while the cold Antarctic air is not becoming warmer because of the heat radiated from the penguins' bodies. Therefore, option (d) is eliminated. Therefore, we are left with option (b) as the only plausible context or reference which is the right choice.

19. (a) Let us find out whether the passage explains the factor responsible for emperor penguins losing body heat. Now let us go to each of the options one by one.

Option (a) is reproduction process. The passage briefly hints that penguins need to conserve body heat during the reproduction process.

Regarding option (b), the passage says something about thermal radiation as follows: "The penguins do lose internal body heat to the surrounding air through thermal radiation, just as our bodies do on a cold day. Because their bodies (but not surface plumage) are warmer than the surrounding air, heat gradually radiates outward over time, moving from a warmer material to a colder one."

Option (c) is food metabolism. Is food metabolism responsible for penguins losing body heat? The relevant sentence in the passage claims: To maintain body temperature while losing heat, penguins, like all warm-blooded animals, rely on the metabolism of food. It is clear that food metabolism is a strategy to conserve the body heat rather than losing heat. Therefore, we can eliminate this option.

Option (d) is plumage. The passage claims that the outer air temperature is warmer than the plumage temperature: "the birds minimize heat loss by keeping the outer surface of their plumage below the temperature of the surrounding air."

Let us now analyze these options. The passage clearly states that plumage is responsible for generating body heat. Food metabolism also helps generate the body heat. The passage says that penguins lose body heat due to thermal radiation but the given choice is thermal convection. The passage says the following about thermal convection: "the simulation showed that they



might gain back a little of this heat through thermal convection". It means penguins gain body heat through thermal convection, while the question is about losing the body heat. Therefore, options (b), (c), and (d) are incorrect.

Option (a) briefly hints that penguins need to conserve body heat during the reproduction process. Another line in the passage claims: "And given the Emperors' unusually demanding breeding cycle, every bit of warmth counts..." This means the penguins are exposed to heat loss during the breeding cycle. In other words, their reproduction process results in heat loss. So option (a) is the correct choice.

20. (c) According to the question, all of the choices except any one of them offer us evidence that the character of Aladdin is based on Hanna Diyab, that is Diyab can be said to be author of Aladdin's character. We will have to visit the options one by one.

Option (a) is about Diyab's cosmopolitanism and cross culture experience. This could well be the evidence because Diyab is in a position to create the narrative that characterizes the world of East and West. For instance, he can easily blend the story telling tradition of his home land with the wonderful world of 18th century France. He is thus capable of describing the wealth of Versailles due to his cross cultural experience. Therefore, option (a) is evidence, not an exception. Similarly, option (d) is also ruled out as an exception because it is evidence.

Now coming to Option (b), we can also find the evidence in it. If you read the second paragraph of the passage, you can find that Diyab wrote a travelogue in the mid 18th century. In this travelogue, he mentions having told Galland the story of Aladdin. He also mentions his hard-knocks upbringing in this travelogue, which supports the evidence that he could have possibly created the character of Aladdin.

If we notice the option (c) carefully, we would notice that it is merely Diyab's narration of the original story of Aladdin to Galland. This cannot be taken as the evidence that Diyab is the creator of Aladdin's character. It only means that he may have heard the story from some other source and is merely narrating it. In other words, it is not evidence in favour. It also means that this option is an exception, while all other options are evidences. Therefore, option (c) is our answer.

21. (b) Read the last paragraph of the passage. It gives us a clue to the answer why story tellers are still fascinated by the story of Aladdin. According to the first few sentences of the last paragraph, "To the scholars who study the tale, its narrative drama isn't the only reason storytellers keep finding reason to return to Aladdin. It reflects not only "a history of the French and the Middle East, but also [a story about] Middle Easterners coming to Paris and that speaks to our world today," as Horta puts it."

From the above sentences, it cannot be inferred that it is about 18th century French Orientalist attitude. There is no mention about it in the passage. It is also not about rags to riches story that makes the story fascinating even today. There is no mention of this in the passage. However, it is not only a history of French and the Middle East but also a story about Middle Easterners coming to Paris and that speaks to our world today. In other words, it can be inferred that the traveller's experience that inspired the tale of Aladdin resonates even today. Therefore, option (b) is the right choice.

22. (a) Let us understand the question. In simple terms we have to select the option that explains the origin of the story of Aladdin in the passage. It is also certain that author will most likely agree with this explanation. If you read the passage carefully, you will realize that the author is trying to prove that Diyab is the author of the passage. The choice that most certainly proves Diyab as the author of Aladdin is the best choice.

Option (a) claims that author of Aladdin is Diyab. This could be your possible choice. Let us see other options as well.

According to Option (b), the story of Aladdin came from Diyab but it came to Diyab from an incomplete medieval manuscript. In other words, it is doubtful that Diyab is the original author of the story of Aladdin. Therefore, we may have to reject option (b).

Option (c) does not even mention Diyab as the author but claims that the story of Aladdin can be attributed to an undiscovered, incomplete manuscript of a medieval Arabic collection of stories. So this option is also rejected. Option (d) is also rejected because it claims to have derived the story of Aladdin from Diyab's travelogue. In other words, the story of Aladdin is attributed to Galland. Therefore, our best choice is option (a).

23. (c) We have to find out which among the given choices does not answer or contribute to the claim about Aladdin's authorship. Let us verify each of the options one by one. Option (a) is about Diyab as the author of the Aladdin. Therefore, it contributes to the claim. Option (b) is clearly found in the passage. Read the following in the passage towards the end: "...Diyab's memoir reveals a narrator adept at capturing the distinctive psychology of a young Protagonist...". Option (d) is "Galland's acknowledgment of Diyab in his diary". This choice supports the claim that Diyab could be the author of Aladdin. This leaves us with option (c). This option does not support the claim because the author disputes the evidence of 'the French fairy tales'. Read the following sentence in the passage: "The idea that Diyab might have based it on his own life — the experiences of a Middle Eastern man encountering the French, not vice-versa — flips the script." The meaning is clear. The story or script that Aladdin was inspired by French Fairy Tales of the 18th century is getting flipped.

24. (d) The given phrase is “flips the script”. It means change our understanding of something. In the present context, the initial thinking of the scholars was Aladdin was inspired by the 18th century French Fairy tales. However what flips the script in this case is the idea that “Diyab might have based it on his own life — the experiences of a Middle Eastern man encountering the French, not vice-versa — flips the script.” Now the question is what or which among the given options considering them to be true would invalidate the idea that the script is based on Diyab’s life.

In other words, which among the given choices would establish the opposite of the contention made out by the phrase ‘flip the script’. The key to answering this question correctly lies in understanding the question. When the inversion in flips the script is invalidated, the credit for Aladdin is not given to Diyab. So your task is to find an option that either takes away the credit from Diyab or does not give him credit for Aladdin. Option (a) in some ways directly or indirectly gives credit to Diyab. So it cannot be the answer.

Option (b) also gives credit to Diyab indirectly because this option refers to Diyab’s travelogues with the only difference that the city described is Bordeaux instead of Versailles. The link between Diyab and Aladdin still exists in this option.

Option (c) does not take away credit from Diyab. This option claims that French fairy tales of the eighteenth century did not have rags-to-riches plot lines like that of the tale of Aladdin. In fact this claim only endorses the credit to Diyab.

Option (d) appears to be the right choice because we find Diyab discredited for Aladdin because description of opulence in Hanna Diyab’s and Antoine Galland’s narratives bore no resemblance to each other. If there is no resemblance, it means only one thing and that is there is no evidence that Diyab ever narrated the story to Galland as the same is claimed by Galland in his diary. This fact would dispute the fact that Hanna Diyab created the character of Aladdin.

25. (dabc)

Reading the four sentences cursorily gives us a hint that they are about algorithm of collaborative filtering. Since the statement (d) introduces the topic and briefly explains collaborative algorithm, this is the first sentence in the sequence. The next sentence will be (a) because it gives the example of collaborative filtering along with the first hand experience to the readers. The next statement should talk about the problem with these algorithms. This statement is (b). The only one option is left now. This is option (c) and it follows the sequence by giving an example of the problem with these algorithms.

26. (b) At its first glance all the five options look related. Therefore, we will begin sequencing each sentence step by step.

Statement (e) looks like the opening statement: For millennia, people with hearing impairments encountered

marginalization because it was believed that language could only be learned by hearing the spoken word. The idea is further expanded in sentence (c).

Marginalization is a form of prejudice. So the next sentence will be option (d) which speaks against this prejudice: Pushback against this prejudice began in the 16th century when Pushback against this prejudice began in the 16th century when Pedro Ponce de León created a formal sign language for the hearing impaired.

The next sentence will be sentence (a) because it begins with ‘his’. It is used for Pedro Ponce de León. So the sentence will be: His idea to use sign language was not a completely new idea as Native Americans used hand gestures to communicate with other tribes.

From above, option (b) is left out as an odd one out. This will be our answer.

27. (b) When we begin looking for an opening sentence, we find only sentence (d) appears like an opening sentence. The other sentences are in need of some meaningful claim before them. They are abrupt and not clear unless some meaningful sentence precedes them. The sentence (d) talks about three suffix as symbols. These three suffix as symbols are further explained in sentence (a). Therefore (d) and (a) will form a sequence. Something more on suffix is added by statement (e), that is, to gain the suffix was to acquire a proud and optimistic emblem of the electronic and atomic age. From here, we can see that something more is further added to explain or discuss suffix (morphemes). Thus the sequence we get is daec. Option (b) emerges as the odd one out. It is unrelated to the passage and speaks of something entirely different out of the blue. Therefore answer is (b).

28. (bcda)

I could be either in the beginning or in the end because it is in the nature of introduction or conclusion. However, it will not come in the beginning because it starts off by differentiating print-reading and mind reading. We must have these terms explained before this sentence.

If you notice the statement (d), it has discussed these terms. Therefore, it is clear that I will follow (d). That is (d) will come first and then (a) will be there. Therefore, we have (d, a) sequences.

Our opening sentence can be either (b) or (c). It may be noted that (b) has a better introductory tone which should be followed by statement (c) because this statement explains what mind reading is. Immediately after mind reading, we have the statement on print reading, which should follow statement (c).

The final sequence we have now is (b, c, d, a). This is the correct answer.

29. (b) The passage is about pure science and applied science with specific examples of physics and engineering. The passage makes a further claim that engineers may find some theories of physics useful even when they are not validated by physics. The passage also discusses about the challenges of validating a theory in physics.



Option (a) is completely off the mark. According to this option relationship between pure and applied science is strictly linear, with the pure science directing applied science. In the passage we actually find that pure science is not always directing the applied science. The theories that are false in pure science are used in the applied science.

Option (c) does not capture the sense of the passage. It says "The unique task of the engineer is to identify, understand, and interpret the design constraints to produce a successful result." This is not the complete sense of the passage because the passage talks about the relationship between the pure science and the applied science.

Option (d) distorts the meaning of the passage. It says Engineering and physics fundamentally differ on matters like building a bridge or a nuclear reactor. The passage talks about the broad differences and the relationship between pure and applied science. Option (d) is just a specific example, so it can be eliminated. Option (b) captures the essence of the passage. It says "Though engineering draws heavily from pure science, it contributes to knowledge, by incorporating the constraints and conditions in the real world." Therefore, it is the correct choice.

30. (b) If we read the passage carefully, we can tone it down to few essential elements. These are: 1. Language and displaced reference 2. Ability to think about distant things precedes the ability to speak about them. (c). Mental categories can be invoked even in the absence of immediate stimuli.

Option (a) This option makes the mistake of claiming that only humans have the ability to think about objects not present in their surroundings. Even if this claim is true, this assertion is nowhere made in the passage.

Option (c) This option can be ruled out because displaced reference is a distinguishing feature of language, not of humans. (For example: This may not have been true of primitive humans who had not developed a language).

Option (d) Option (d) can be ruled out because this option claims that thoughts precede all speech acts, while the passage claims that "Thought precedes meaningful referential communication". There is a difference between the two.

Option (b) This option is exact and to the point. It does not clash with anything made out in the passage.

31. (d) If you read the options carefully, you will understand that you need to have a clear understanding of "hidden persuasion", "subliminal level", "supraliminal level" etc. You can find the essence of the passage in the conclusion, which is: "individuals do not always have access to their conscious thoughts and can be persuaded by supraliminal messages without their knowledge." Now your task is to find the statement that is closest to this statement.

Option (a) talks about subliminal level, so we can

eliminate it. Option (c) also talks about subliminal level, so we can eliminate it.

Now the choice is between option (b) and option (d). However, we will have to eliminate option (b) because it says that "the people targeted are aware of being persuaded," while the truth according to the passage is "individuals do not always have access to their conscious thoughts and can be persuaded by supraliminal messages without their knowledge". Option (d) is closest to this view because it maintains that "though the people targeted have no awareness of being persuaded." So option (d) is the correct choice.

### 32. (cbda)

If you read the statements as given in the question, you will note that they are all about the phrase *carpe diem*. The first sentence therefore, has to be the one that explains the phrase. The statement (c) explains the phrase, so it will come first. The second sentence/statement has to be the one that digs its background or history. This statement is the second statement. That is (c) is followed by (b), so we get (cb). The next statement may be about its example or about the problems with phrases when translating from one language to the other. So, the next statement will be (d). The sequence we get now is (cbd). Since (a) is the only one left, it will automatically come there. We can also note that (a) is in the form of a conclusion or general statement. Therefore, the sequence we get now is (cbda).

### 33. (cbda)

If you read the four sentences randomly, you will realize it is about social media and our response to it. Statement (c) is the introductory sentence because it opens the discussion by making a claim that we must be open to legitimate criticism as we learn to live with social media. This is a sentence about what we need to learn. The next related sentence is also about what we need to learn more. This is about responding to feedbacks. This is given out in sentence (b). The next related sentence is about new norms emerging due to increased social media interaction. This is statement (d). Finally we are left with sentence one (a). This is in the form of the conclusion or a generalized statement. Therefore, the sequence is (cbda).

### 34. (dceb)

together, odd one out (a)

Statement (d) looks like an introductory sentence on the topic of identity. Statement (c) is closely related to (d) as it expands the notion of identity by claiming that some organizations have complex and multidimensional identities. Therefore (d) and (c) will come together. The next sentence will be (e) because it explains the opinion of some people on complex identities and their advantages to an organization. Statement (b) follows (e) because it explains the opinion of others on complex identity and how it can be disadvantageous to an organization. Therefore, we are left with only (a). This statement is totally unrelated to the four statements that are related. So (a) is the odd one out.

**Sol. (35-38):** From the given data,  $X$ ,  $U$  and  $Z$  are standing at the three corners of the triangle formed by three street so, they can be at any of  $b, c, f, g$  intersection.

Now,  $X$  cannot be at position  $g$ , since  $X$  can see only two people.

$U$ ,  $Z$  and  $V$  are standing in a line and  $Z$  and  $V$  are standing next to each other. Also  $Z$  and  $X$  are not at  $b$  and  $g$  as then  $V$  won't be standing in the same row. Hence  $X$  is on  $b$ .

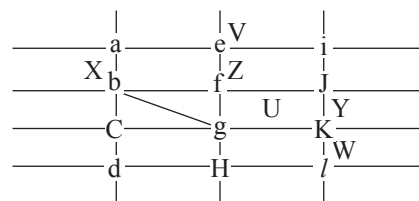
Since  $X$  can only see  $U$  and  $Z$ , no one is standing at  $a, c$  and  $j$ .  $W$  cannot see  $V$  or  $Z$ . Therefore,  $W$  cannot be at  $h$  or  $i$ . So  $W$  will be at  $k$  or  $l$ .

If  $W$  is at  $k$ ,  $Y$  will be at  $h, i$  or  $l$ . In none of these three places  $Y$  can see both  $U$  and  $W$ .

Therefore,  $W$  is at  $l$ . For  $Y$  to be able to see only  $U$  and  $W$ ,  $Y$  has to be at  $k$ .

For  $Y$  to be able to see  $U$ ,  $Y$  has to be at  $e$ . But in this case,  $Y$  will be able to see  $Z$  and  $V$  as well. But  $Y$  can only see  $U$  and  $W$ . Hence, this is not possible.

Hence, People are standing in the following way:



**35. (c)** No one is standing at intersection  $a$ .

**36. (d)**  $V$  can see  $U$  and  $Z$  only.

**37. (c)**  $X$  must cross two segments ( $b-g-k$ ) to reach  $Y$ .

**38. (c)** When a new person is standing at  $d$ , that person can see only  $W$  and  $X$ .

**Sol. (39-42):** From the given graph, we can arrange the top ten states/UTs in decreasing order of crimes in three categories:

#### IPC Crime:

Delhi (65), Goa (27), Karnataka (16), Maharashtra (16), Kerala (8), Telangana (4), Haryana (3), Tamil Nadu (2), Ponducherry (1), West Bengal (0)

#### SLL Crime

West Bengal (520), Karnataka (49), Delhi (35), Goa (33), Maharashtra (33), Haryana (27), Tamil Nadu (24), Telangana (15), Kerala (14), Ponducherry (0)

#### Other Crimes:

Delhi (46), Tamil Nadu (34), Ponducherry (30), Karnataka (26), Goa (19), Kerala (12), Haryana (7), Maharashtra (6), Telangana (6), West bengal (0).

States	Total Crimes	IPC Crime	Rank in IPC Crime	SLL Crime	Rank in SLL Crime	Other Crimes	Rank in other Crimes
Delhi	144	65	1	35	3	46	1
Goa	79	27	2	33	4	19	5
Haryana	37	3	8	27	6	7	7
Karnataka	91	16	3	49	2	26	4
Kerala	34	8	5	14	9	12	6
Maharashtra	55	16	3	33	4	6	8
Ponducherry	31	1	13	0	29	30	3
Tamil Nadu	64	2	11	24	7	38	2
Telangana	25	4	6	15	9	6	8
West Bengal	520	0	17	520	1	0	16

**39. (5)** From the table, Karnataka and Maharashtra are ranked 3. Therefore, from the above, we can say that Delhi and Goa are ranked 1 and 2 respectively. Telangana is ranked 6. From this, it can be inferred that Kerala is ranked 5 in IPC crimes.

**40. (c)** The two states with the highest total number of cases are Delhi and West Bengal.

The total number of IPC crimes = 65 in Delhi + 0 in West Bengal = 65

The total number of SLL crimes = (95 – 65) in Delhi + 520 in West Bengal = 550.

Therefore, the ratio =  $\frac{65}{550} \approx \frac{1}{9}$

**41. (d)** From table, we see that rank in the 'other crimes' category of 'Tamil Nadu and Ponducherry' are '2 and 3' respectively.

Hence, both (i) and (ii) are true.

**42. (5)** Sum of Rank of Delhi in all the three categories = 1 + 3 + 1 = 5

**Sol. (43-46):**

From condition (4): K is placed in shelf no 16

From condition (3): D, E and F are placed after all Biscuits and Candies. So, D, E, F and K are savouries and placed at position 13, 14, 15 and 16.

From condition (1, 2 and 5) : A and B are placed in consecutive number, So are of same type, like that I and J of same type. Again L and J are of same type, different from type of H.

From condition (6) : C is a candy. Number of candies are three and that are C, G and H

Thus, A, B, I, J and L are biscuits.

Combining all conditions, we get

Biscuits : A, B, I, J and L.

Candy : C, G and H.

Savouries : D, E, F and K.

As L is preceded by one empty shelf and C is preceded by two empty shelves. So, possible arrangement of biscuits are L A B I J or LABJI.

and possible arrangement of candies are C G H or C H G.

Let the income of Bimala be ₹100

Then Amla's income =  $1.2 \times 100 = ₹120$

and arrangement of savouries are

D, E, F, K at position 13, 14, 15, 16

Now, one of the possible arrangement of 12 items in 16 shelves position are like this :

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Empty	L	A	B	I	J	Empty	Empty	C	G	H	Empty	D	E	F	K
← Biscuits →								← Candy →			← Savouries →				

43. (b) Total number of different ways in which biscuits can arrange = 2 {By changing I and J position}

Total number of different ways in which candy can arrange = 2 {by changing G and H position}

total number of different ways in which empty at 1 and (7 and 8 together) can arrange = 2.

Hence, total number of arrangement =  $2 \times 2 \times 2 = 8$

44. (c) G is a candy not a biscuit.

45. (b) There are two possible ways for empty shelves 1, 7, 8, 12 or 1, 2, 6, 12

46. (a) In the given arrangement number of shelf between B and C = 4

There is other way of arrangement in which 'C' is at position '3' and 'B' is at position '9'

Then number of shelves between B and C = 5.

47. (2) The minimum possible number of different types of prizes is 2 when the number of items of type a and b are 1 and 99 respectively.

48. (6) From question, number of items atleast doubles as you move to the next type. For minimum number of boxes each type let  $a = 1$ ,  $b = 2$ ,  $c = 4$ ,  $d = 8$ ,  $e = 16$ ,  $f = 32$ ,  $g = 64$  and so on. But the number of items of type  $g = 64$  is not possible because the total number of boxes will be 127 in that case. Therefore, there cannot be 7 types

of prizes. But 6 types of prizes is possible. For example, the number of items of type  $a, b, c, d, e$  and  $f$  can be 1, 2, 4, 8, 16 and 69 respectively. Therefore, the maximum possible number of different types of prizes is 6.

49. (b) There can be 30 items of type b, when there are 69 items of type c.

There can be 75 items of type e, when the number of items of type b, c and d are 3, 7 and 14 respectively. There can be 60 items of type d, when the number of items of type b and c are 11 and 28 respectively.

But there cannot be 45 items of type c. Because in that case, the maximum number of items of type b can be 22. Since the total number of items is not 100, we have to go to the next type. i.e. d, The number of items of d would have to be at least 90. This is not possible because the total number of items will be at least 138, but we only have 100. Hence cannot be 45 items of type c.

50. (c) The maximum possible number of prizes can be 5. In that case, the maximum possible number of items should belong to type e. There can 75 items of type e, when the number of items of type b, c and d are 2, 4 and 18 respectively.

Therefore, the maximum possible number of different type of items is 5.

**Sol. (51-54):**

From the given radar graph, we get the following data.

	Cost	Reliability	Reach	Quality	Features	Customer Service
Vendor 1	75	55	80	75	40	55
Vendor 2	80	40	55	70	45	40
Vendor 3	90	75	65	65	55	50
Vendor 4	70	25	45	40	90	70
Vendor 5	60	60	70	50	75	30

**51. (a)**

Arranging the given data of five vendors on six aspects in increasing order :

(i) Cost : 60, 70, 75, 80, 90

$$\text{Median score} = \left(\frac{5+1}{2}\right)^{\text{th}} \text{ score} = 3^{\text{rd}} \text{ score} = 75$$

(ii) Reliability : 25, 40, 55, 60, 75

$$\text{Median score} = 3^{\text{rd}} \text{ score} = 55$$

(iii) Reach : 45, 55, 65, 70, 80

$$\text{Median score} = 3^{\text{rd}} \text{ score} = 65$$

(iv) Quality : 40, 50, 65, 70, 75

$$\text{Median score} = 3^{\text{rd}} \text{ score} = 65$$

(v) Features : 40, 45, 55, 75, 90

$$\text{Median score} = 3^{\text{rd}} \text{ score} = 55$$

(vi) Customer service : 30, 40, 50, 55, 70

$$\text{Median score} = 3^{\text{rd}} \text{ score} = 50 \text{ (Least score)}$$

**52. (d)**

Vendor's final score = Average of their scores

Average score of

$$\text{Vendor 1 : } \frac{75+80+90+70+60}{5} = 75$$

$$\text{Vendor 2 : } \frac{55+40+75+25+60}{5} = 51$$

$$\text{Vendor 3 : } \frac{60+55+65+45+70}{5} = 59$$

$$\text{Vendor 4 : } \frac{40+45+55+90+75}{5} = 61$$

$$\text{Vendor 5 : } \frac{55+40+50+70+30}{5} = 49$$

As, Average score of Vendor 1 is highest, so, Vendor 1 has highest maximum score.

**Sol. (53-54):**

Top three scores in six aspects :

	Cost	Reliability	Reach	Quality	Features	Customer Service
Top scorer	Vendor-3	Vendor-3	Vendor-1	Vendor-1	Vendor-4	Vendor-4
Second top scorer	Vendor-2	Vendor-5	Vendor-5	Vendor-2	Vendor-5	Vendor-1
3rd top scores	Vendor-1	Vendor-1	Vendor-3	Vendor-3	Vendor-3	Vendor-3

**53. (c)** Hence, Vendor-1 and Vendor-5 are top two scorers on the maximum number of aspects.

**54. (c)** From the table Vendor-3 are top among top three scorers on the maximum number of aspects.

**Sol. (55-58):**

	B	H	A	A	G	F
+	A	H	J	F	K	F
A	A	F	G	C	A	F

(i) At unit place, we see  $F + F = F$ , this is only possible for  $F = 0$ .

(ii)  $H + H = F \Rightarrow H + H = 0$ , this is only possible for  $H = 5$

(iii)  $B + A = AA$

Here sum of two numbers gives two digits number whose digits are same.

As  $B$  and  $A$  are single digit number

So,  $B + A = AA$ . This is only possible for  $B = 9$ ,  $A = 1$

Now consider  $BH + AH = AAF$ .

$$\Rightarrow 95 + 15 = 110$$

(iv)  $A + F = C \Rightarrow 1 + 0 = C$

As  $A \neq C$ , so, possible value of  $C = 2$

To get  $C = 2$ , there must be a carry = 1 from the sum  $(G + K)$

(v) From  $A \quad A \quad G \quad 1 \quad 1 \quad G$

$$\begin{array}{r} J \quad F \quad K \Rightarrow J \quad 0 \quad K \\ G \quad C \quad A \quad G \quad 2 \quad 1 \end{array}$$

Here we get  $G = J + 1$  and  $G + K = 11$

Thus possible value of  $(J, G, K) = (3, 4, 7), (6, 7, 4)$  and  $(7, 8, 3)$

On summation of all points, we get

$A \rightarrow 1, B \rightarrow 9, C \rightarrow 2, F \rightarrow 0, H \rightarrow 5$  and  $(J, G, K) \rightarrow (3, 4, 7), (6, 7, 4)$  or  $(7, 8, 3)$

**55. (1)** Possible value of  $A = 1$

**56. (9)** Possible value of  $B = 9$

**57. (7)** From point (v), we get in all cases  $D$  cannot be represented by 7.

**58. (6)** Again from (v),  $G = J + 1$ ,  
when  $G = 6, J = 5$ , but we get  $H = 5$ , so,  $G \neq 6$ .

**Sol. (59-62):**

From given data, we get that total score of Tanzi = Umeza = Yonita

Since Tanzi played another round, he/she must have hit bulls'eye in either Round 1 or Round 3. In the other round, let us say that Tanzi scored  $x$ . So Tanzi's total score would be  $14 + x$ .

Umeza played Round 4 and Round 5. This means Umeza have hit bull's eye in two of the first three rounds. In the remaining round, let Umeza's, score be  $y$ . Umeza's total score would be  $13 + y$ .

Yonita played round 4, he/she must have hit bull's eye in round 1 or round 2. Let Yonita scored  $z$  in either of round 1 or 2, then, his/her total score =  $5 + Z + 3 + 5 = 13 + Z$ .

Since the total score was not a multiple of 3 for only one person and Tanzi, Umeza and Yonita had the same total score  $14 + x$ ,  $13 + y$  and  $13 + z$  should be multiples of 3.  $14 + x$  will be a multiple of 3 if  $x = 1$  or 4. In that case the total score will be 15 or 18.

$13 + y$  will be multiple of 3 if  $y = 2$  or 5. But if  $y = 5$ , then Umeza would have been played Round 6. Therefore,  $y = z = 2$  and  $x = 1$ . The total score of Umeza, Tanzi and Yonita is 15.

Since Wangdu did not play any round after Round 3, the maximum score that Wangdu can get is 12 when he scores 4 in both round 1 and round 3.

Since Xyla played all the rounds, Xyla must have scored 5 in each of the first three rounds. So Xyla's minimum total score is 22 and maximum total score is 26, based on Xyla scored (1 to 5) in round 6.

Zeneca played round 4 and round 5. So Zeneca must have hit bull's eye and have scored 5 in two of the first three rounds. So Zeneca's minimum and maximum total scores are 21 and 24 respectively. Therefore, Wangdu had the lowest score.

If Wangdu scored 12, then the highest score would be 25. Only Xyla can score 25 (5 in the first three rounds and 4 in round 6).

If Wangdu scored 11, then the highest score would be 23. This is not possible because there will be two total scores that are not multiples of 3.

If Wangdu scored 10, then the highest score would be 21. But we know that Xyla's minimum score is 22. Therefore, this is not possible.

Any score of Wangdu less than 10 would mean the highest score is less than 20 but we know that Xyla's minimum

score is 22. Therefore, Wangdu scored 12 and Xyla scored 25 is only possible value.

Xyla's total score is 25, which is not a multiple of 3. Hence, Zeneca's total score must be a multiple of 3, Zeneca would have scored 21 or 24.

Tanzi and Zeneca scored the same in round 1. Tanzi's score in round 1 is either 1 or 5. If Tanzi scored 1 in round 1, then Zeneca would also have scored 1 in round 1. But in this case, both Zeneca and Tanzi would have scored 5 in round 3. But it is given that their scores in round 3 are different. Therefore, Tanze scored 5 in round 1 and 1 in round 3.

The number of players hitting bull's eye in round 2 is either 2 or 4. If it is 2, then the total number of 5s in round 2 and round 3 combined should be 3. Two of those 5s were scored by Xyla. Umeza and Zeneca would each have scored at least one 5 in rounds 2 and 3 combined but in this case, the number of 5s in round 2 and 3 combined would be at least 4, which is not possible. Therefore, the number of players hitting bull's eye in round 2 are 4. Since Tanzi and Wangdu scored 4 in round 2, all the other players would have hit bull's eye in round 2. This means that the number of players hitting bull's eye in round 3 are 2. Xyla is one of them and the other one has to be either Umeza or Zeneca. But if Zeneca had scored 5 in Round 3, then Zeneca would have played round 6, which Zeneca didn't. Therefore Umeza is the other person who scored 5 in round 3.

Since Umeza's total score is 15, Umeza scored 2 in round 1. Since Yonita's total score is 15, Yonita scored 2 in round 1. Zeneca's total score cannot be 21 because in that case, both Zeneca and Tanzi would have scored the same in round 3, but they had different scores.

Therefore, Zeneca scored 4 in round 3.

After adding all, we get that table :

	Round 1	Round 2	Round 3	Round 4	Round 5	Round 6	Total
Tanzi	5	4	1	5	NP	NP	15
Umeza	2	5	5	1	2	NP	15
Wangdu	4	4	4	NP	NP	NP	12
Xyla	5	5	5	1	5	4	25
Yonita	2	5	3	5	NP	NP	15
Zeneca	5	5	4	5	5	NP	24

59. (d) The highest total score was 25.

60. (b) Zeneca's total score was 24.

61. (b) The statement, "Xyla was the highest scorer", true.

62. (d) Tanzi's score in Round 3 was 1.

Sol. (63-66):

From the information given, total number of performance  $4 \times 2 = 8$

From fact (i) to (iv), Queen got its dance items assigned by either, Dyu, Gagan or Ashman and Samragini get its dance items assigned by either Badal, Dyu or Gagan.

First item performed by Princess and assigned by badal

Last item performed by Rani and assigned by Ashman

As sequence of performance was same. So, Princess performed at number 1 and 5, while Rani performed at number 4 and 8

Now from (v) item assigned by Ashman were performed continuously. So, Ashman assigned item Rani at 4<sup>th</sup> performance and Princess at 5<sup>th</sup> performance.

Again, number of performance between item assigned by other three are same, so Badal assigned performance at 6<sup>th</sup>



number. And Samraghi was performed at 6<sup>th</sup> place followed by Queen performance assigned by Dyu. Gagan assigned item to Rani at 8<sup>th</sup> performance.

Sequence	Dancer	Music Composer
1	Princess	Badal
2	Samraghi	Dyu
3	Queen	Gagan
4	Rani	Ashman
5	Princess	Ashman
6	Samraghi	Badal
7	Queen	Dyu
8	Rani	Gagan

63. (a) Only the statement, The second performance was composed by Dyu", is true.
64. (c) Queen did not perform in any item composed by Gagan is false.
65. (a) Sixty performance was composed by Badal.
66. (d) The 1<sup>st</sup> and 6<sup>th</sup> performances are composed by the same composer.

67. (b) Given,  $(5.55)x = 1000 \Rightarrow (5.55)x = 10^3$   
Taking log both the sides, we get

$$x \log_{10}(5.55) = 3 \Rightarrow \log_{10}(5.55) = \frac{3}{x}$$

$$\Rightarrow \log_{10}(10 \times 0.555) = \frac{3}{x}$$

$$\Rightarrow \log_{10}(0.555) + 1 = \frac{3}{x} \quad \dots(i)$$

Also given,  $(0.555)y = 1000$

Taking log both the sides, we get

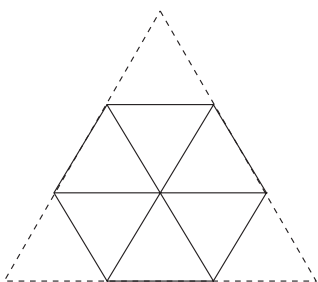
$$y \log_{10}(0.555) = 3$$

$$\Rightarrow \log_{10}(0.555) = \frac{3}{y} \quad \dots(ii)$$

From (i) and (ii), we get

$$\frac{3}{y} + 1 = \frac{3}{x} \Rightarrow \frac{1}{x} - \frac{1}{y} = \frac{1}{3}$$

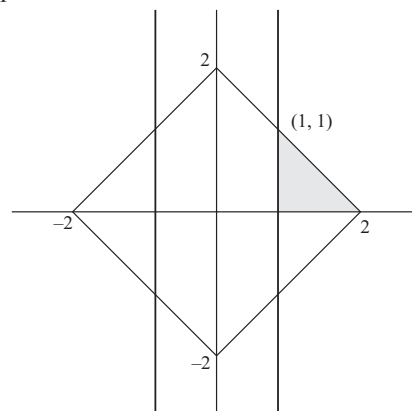
68. (a) Refer to the below figure.



As we can see, the triangle can be divided into 9 congruent smaller equilateral triangles. Also, hexagon contains 6 of them.

$\therefore$  The required ratio =  $6 : 9 = 2 : 3$

69. (2) The below figure shows the graph of both the given expressions



The required area =  $4 \times$  the area of the shaded triangle.

$$\text{Area of the shaded triangle} = \frac{1}{2} \times 1 \times 1 = \frac{1}{2} \text{ sq. units}$$

$$\text{Therefore, the required area} = 4 \times \frac{1}{2} = 2 \text{ sq. units}$$

70. (6144)

$$\text{If } n = 1, \text{ then } a_1 = 3(2^{1+1} - 2) = 6 = 3 \times 2^1$$

$$\text{If } n = 2, \text{ then } a_1 + a_2 = 3(2^{2+1} - 2) = 18 \Rightarrow a_2 = 18 - a_1 = 18 - 6 = 12 = 3 \times 2^2$$

$$\text{If } n = 3, \text{ then } a_1 + a_2 + a_3 = 3(2^{3+1} - 2) = 42 \Rightarrow a_3 = 42 - (a_1 + a_2) = 24 = 3 \times 2^3$$

Similarly,  $a_n = 3 \times 2^n$

$$\text{Therefore, } a_{11} = 3 \times 2^{11} = 6144$$

71. (d) As  $a_1, a_2, a_3 \dots$  are in A.P.

$$\text{then, } \frac{1}{\sqrt{a_1} + \sqrt{a_2}} + \frac{1}{\sqrt{a_2} + \sqrt{a_3}} + \dots + \frac{1}{\sqrt{a_n} + \sqrt{a_{n+1}}}$$

$$= \frac{\sqrt{a_2} - \sqrt{a_1}}{a_2 - a_1} + \frac{\sqrt{a_3} - \sqrt{a_2}}{a_3 - a_2} + \dots + \frac{\sqrt{a_{n+1}} - \sqrt{a_n}}{a_{n+1} - a_n}$$

$$= \frac{\sqrt{a_2} - \sqrt{a_1}}{d} + \frac{\sqrt{a_3} - \sqrt{a_2}}{d} + \dots + \frac{\sqrt{a_{n+1}} - \sqrt{a_n}}{d}$$

{Where  $d$  = Common difference}.

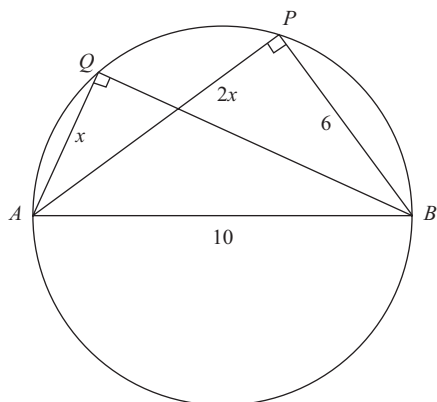
$$= \frac{\sqrt{a_{n+1}} - \sqrt{a_1}}{d}$$

$$= \frac{(\sqrt{a_{n+1}} - \sqrt{a_1})(\sqrt{a_{n+1}} + \sqrt{a_1})}{d(\sqrt{a_{n+1}} + \sqrt{a_1})}$$

$$= \frac{a_{n+1} - a_1}{d(\sqrt{a_{n+1}} + \sqrt{a_1})} = \frac{n \cdot d}{d(\sqrt{a_{n+1}} + \sqrt{a_1})}$$

$$= \frac{n}{\sqrt{a_{n+1}} + \sqrt{a_1}}$$

72. (a)



Since  $AB$  is a diameter, therefore  $\angle AQB$  and  $\angle APB$  are angles in the semi-circle and hence are right-angles.

i.e.  $\angle APB = \angle AQB = 90^\circ$

Let  $AQ = x$ , then  $AP = 2x$

In right  $\triangle APB$ ,

$$AP^2 = AB^2 - BP^2 \Rightarrow AP^2 = 10^2 - 6^2 = 8^2$$

$$\Rightarrow AP = 8 \Rightarrow 2x = 8$$

$$\Rightarrow x = 4$$

In right  $\triangle AQB$

$$BQ^2 = AB^2 - AQ^2$$

$$\Rightarrow BQ^2 = 10^2 - 4^2 = 84$$

$$\Rightarrow BQ = \sqrt{84} \approx 9.1$$

73. (b) Let  $x$  be the average of all 22 students and Gautam's score be  $G$ .

Hence, total scores of all 22 students =  $22x$ .

From the first given condition,

$$22x - G = 21 \times 62$$

...(i)

From the second given condition,

$$22x - 82.5 = 21(x - 1)$$

$$\Rightarrow 22x - 21x = 82.5 - 21$$

$$\Rightarrow x = 61.5$$

On putting  $x = 61.5$  in (i), we get

$$22 \times 61.5 - G = 21 \times 62$$

$$\Rightarrow G = 1353 - 1302 = 51$$

74. (a) Let the total journey time taken by Amal be  $3t$  hours.

Hence, total distance =  $10t + 20t + 30t = 60t$  kms

Bimal took each mode of transport  $1/3$  of the total distance.

$$\text{Therefore, total time taken by him} = \frac{20t}{10} + \frac{20t}{20} + \frac{20t}{30} = \frac{11t}{3} \text{ hours}$$

The percentage by which Bimal's travel time exceeds Amal's travel time

$$= \left( \frac{(11/3)t - 3t}{3t} \right) \times 100 = \left( \frac{\frac{11}{3} - 3}{3} \right) \times 100 = \frac{200}{9} = 22.22\%$$

75. (a) Let the edges of the brick be  $a$ ,  $b$ , and  $c$  such that  $a < b < c$

$$a^2 + b^2 = 3^2 = 9$$

...(i)

$$a^2 + c^2 = (2\sqrt{3})^2 = 12$$

...(ii)

$$b^2 + c^2 = (\sqrt{15})^2 = 15 \quad \dots(\text{iii})$$

Adding all three equations. We get

$$2(a^2 + b^2 + c^2) = 9 + 12 + 15 = 36$$

$$a^2 + b^2 + c^2 = 18 \quad \dots(\text{iv})$$

$$\text{From (i) and (iv), } c^2 = 18 - 9 \Rightarrow c = 3$$

$$\text{From (iii) and (iv) } a^2 = 18 - 15 \Rightarrow a = \sqrt{3}$$

$$\text{Therefore, required ratio} = \frac{a}{c} = \frac{\sqrt{3}}{3} = \frac{1}{\sqrt{3}} \Rightarrow 1:\sqrt{3}$$

76. (b) Let the distance of the common destination =  $d$   
and time taken by first car to reach the destination =  $t$   
then time taken by second car to reach the destination =  $t - 1$ .

$$\therefore \text{Speed of the first car, } S_1 = \frac{d}{t}$$

$$\text{and speed of the second car, } S_2 = \frac{d}{t-1}$$

Percentage increase in the speed of the second car

$$= \frac{S_2 - S_1}{S_1} \times 100$$

$$= \frac{\frac{d}{t-1} - \frac{d}{t}}{\frac{d}{t}} \times 100 = \frac{100}{t-1}$$

$$\text{It is given that } t \geq 6 \Rightarrow t - 1 \geq 5$$

Now percentage increase in the speed of second car will be maximum when  $(t - 1)$  will be minimum i.e. 5.

$\therefore$  maximum percentage increase in the speed of the second car.

$$= \frac{100}{5} = 20$$

77. (b) Ratio of incomes of Amala, Bina and Gouri =  $3 : 4 : 5$   
Ratio of interests of Amala, Bina and Gouri =  $6 : 5 : 4$

Therefore, the ratio of their interest income =  $(3 \times 6) : (4 \times 5) : (5 \times 4) = 18 : 20 : 20$

Let the interest incomes of Amala, Bina and Gouri be  $18x$ ,  $20x$  and  $20x$  respectively.

Since, Bina's interest income exceeds Amala's by Rs 250

$$\text{Therefore, } 20x - 18x = 250 \Rightarrow x = 125$$

$$\text{Total interest incomes} = 18x + 20x + 20x = 58x = 58 \times 125 = 7250$$

78. (880)

Let the first, second and third horses be  $A$ ,  $B$  and  $C$  respectively. Also, let the length of the racecourse be  $x$ .

	A	B	C
I	$x$	$(x - 11)$	$(x - 90)$
II		$x$	$(x - 80)$

Distance = Speed  $\times$  Time

Now,  $DB = SB \times t_1$

From first given condition,

$$x - 11 = SB \times t_1 \quad \dots(i)$$

and from second given condition,

$$x = SB \times t_2 \quad \dots(ii)$$

$$\text{Similarly, } x - 90 = SC \times t_1 \quad \dots(iii)$$

$$\text{and } x - 80 = SC \times t_2 \quad \dots(iv)$$

Now dividing equation (i) by (iii), we get

$$\frac{x-11}{x-90} = \frac{S_B}{S_C} \quad \dots(v)$$

And dividing equation (ii) by (iv), we get

$$\frac{x}{x-80} = \frac{S_B}{S_C} \quad \dots(vi)$$

From equation (v) and (vi), we get

$$\frac{x-11}{x-90} = \frac{x}{x-80}$$

$$\Rightarrow x^2 - 91x + 880 = x^2 - 90x$$

$$\Rightarrow x = 880$$

79. (d) Let the total score of the exam be  $100x$ .  
 Meena's before review = 40% of  $100x = 40x$ .  
 Her score after review =  $40x + 50\%$  of  $40x = 60x$ .  
 Passing marks =  $60x + 35$  ... (i)  
 Her post-review score after increasing by 20% of post-review score =  $60x + 20\%$  of  $60x = 72x$   
 Passing marks =  $72x - 7$  ... (ii)  
 From equations (i) and (ii), we get  
 $72x - 7 = 60x + 35 \Rightarrow x = 3.5$   
 Hence, total marks =  $100x = 350$  and passing marks  
 =  $60x + 35 = 60 \times 3.5 + 35 = 245$   
 Therefore, passing percentage =  $245/350 \times 100 = 70\%$ .

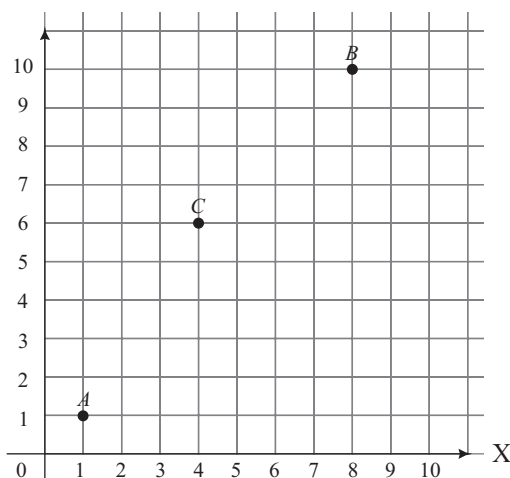
80. (a) Distance travelled by bicycle A in one revolution  
 =  $2\pi ra = 2\pi \times 30 = 60\pi$  cm  
 Distance travelled by bicycle B in one revolution  
 =  $2\pi rb = 2\pi \times 40 = 80\pi$  cm  
 Let B makes 'n' revolutions to cover the distance. Then,  
 A would make  $(n + 5000)$  revolution to cover the same distance.  
 $\therefore n \times 80\pi = (n + 5000) \times 60\pi \Rightarrow n = 15000$   
 Distance travelled by B =  $n \times 80\pi$  cm =  $\frac{15000 \times 80\pi}{10000}$  km  
 =  $12\pi$  km

$$\text{Time taken by B} = 45 \text{ min} = \frac{45}{60} = \frac{3}{4} \text{ hrs}$$

$$\text{Hence the speed of B} = \frac{12\pi}{\frac{3}{4}} = \frac{4 \times 12 \times \pi}{3} = 16\pi \text{ km/h}$$

81. (c) Weight of liquid 1 per litre = 1000 gm  
 Weight of liquid 2 per litre = 800 gm  
 Weight of mixture per litre =  $2 \times 480 = 960$  gm  
 By alligation rule,  

$$\frac{\text{Quantity of liquid 1}}{\text{Quantity of liquid 2}} = \frac{960 - 800}{1000 - 960} = \frac{4}{1}$$
  
 Hence, the liquids are mixed in 4 : 1.  
 $\therefore$  Percentage of liquid 1 =  $\left( \frac{4}{4+1} \right) \times 100 = 80\%$
82. (a) Given,  $\log_5(x+y) + \log_5(x-y) = 3$   
 $\Rightarrow \log_5[(x+y)(x-y)] = 3$   
 $\Rightarrow (x+y)(x-y) = 5^3 = 125$   
 $\Rightarrow x^2 - y^2 = 125$  ... (i)  
 And  $\log_2 y - \log_2 x = 1 - \log_2 3$ .  
 $\Rightarrow \log_2 \left( \frac{y}{x} \right) = \log_2 2 - \log_2 3$   
 $\Rightarrow \log_2 \left( \frac{y}{x} \right) = \log_2 \left( \frac{2}{3} \right) \Rightarrow \left( \frac{y}{x} \right) = \left( \frac{2}{3} \right)$   
 Then if  $x = 3k$ , then  $y = 2k$   
 Now putting this value of  $x$  and  $y$  in (i), we get  
 $(3k)^2 - (2k)^2 = 125$   
 $\Rightarrow 5k^2 = 125, \therefore k = 5$   
 $\therefore x \times y = 3k \times 2k = 6 \times 25 = 150$
83. (3920)
- Let A, B and C represent the coordinates (1, 1), (8, 10) and (4, 6) respectively.



The number of ways to go from  $A$  to  $B$  via  $C$   
 = (The number of ways to go from  $A$  to  $C$ )  $\times$  (The number of ways to go from  $C$  to  $B$ )  
 $= {}^8C_5 \times {}^8C_4 = \frac{8!}{(8-5)!5!} \times \frac{8!}{(8-4)!4!}$   
 $= \frac{8!}{3! \times 5!} \times \frac{8!}{4! \times 4!} = \frac{8 \times 7 \times 6}{6} \times \frac{8 \times 7 \times 6 \times 5}{24}$   
 $56 \times 70 = 3920$

84. (5) **Case I:**  $x = 0$ .

Clearly,  $x = 0$  satisfy the equation

**Case II:**  $x > 0$

$$|x| (6x^2 + 1) = 5x^2 \Rightarrow x(6x^2 + 1) = 5x^2$$

$$\Rightarrow x(6x^2 + 1 - 5x) = 0$$

$$\therefore x \neq 0 \therefore 6x^2 + 1 - 5x = 0$$

On solving the quadratic equation, we get

$$x = \frac{1}{2}, \frac{1}{3} \text{ (both valid)}$$

**Case III:**  $x < 0$

$$|x| (6x^2 + 1) = 5x^2 \Rightarrow -x(6x^2 + 1) = 5x^2$$

$$\Rightarrow -x(6x^2 + 1 + 5x) = 0$$

$$\Rightarrow x(6x^2 + 5x + 1) = 0$$

$$\therefore x \neq 0, \therefore 6x^2 + 5x + 1 = 0$$

On solving the quadratic equation, we get

$$x = \frac{-1}{2}, \frac{-1}{3} \text{ (both valid)}$$

Hence there are 5 solutions.

85. (a) LCM of 9 and 12 = 36

Let the amount of work = 36 units

Let the amount of work done in one day by  $A$  and  $B$  with their normal efficiencies be  $x$  and  $y$  units respectively.

$$\therefore (x + y) \times 12 = 36 \Rightarrow x + y = 3 \Rightarrow y = 3 - x \quad \dots(i)$$

$$\text{and } (x/2 + 3y) \times 9 = 36 \Rightarrow x/2 + 3y = 4 \Rightarrow x + 6y = 8 \quad \dots(ii)$$

Putting the value of  $y$  from eq. (i) into eq. (ii), we get

$$x + 6(3 - x) = 8 \Rightarrow -5x = 8 - 18 \Rightarrow x = 2$$

Therefore,  $A$  alone would take  $36/x = 36/2 = 18$  days to complete the work with her normal efficiency.

86. (b)  $x^2 - x - 6 = (x + 2)(x - 3)$

**Case 1:**  $x^2 - x - 6 < 0 \Rightarrow (x + 2)(x - 3) < 0$   
 $\Rightarrow -2 < x < 3$  and  $|x^2 - x - 6| = -(x^2 - x - 6)$   
 $\therefore |x^2 - x - 6| = x + 2 \Rightarrow -(x + 2)(x - 3) = x + 2$   
 $\Rightarrow (x - 3) = -1 \Rightarrow \boxed{x = 2}$

**Case 2:**  $x^2 - x - 6 \geq 0 \Rightarrow (x + 2)(x - 3) \geq 0$   
 $\Rightarrow x \leq -2$  or  $x \geq 3$

Checking for boundary conditions:

For  $x = -2$ ,  $|x^2 - x - 6| = x + 2$ , therefore,  $\boxed{x = -2}$  is also the root.

But for  $x = 3$ ,  $|x^2 - x - 6| \neq x + 2$

Hence  $x = 3$  is NOT the root.

And for the interval  $x < -2$  or  $x > 3$  the expression  $|x^2 - x - 6|$   
 $= x^2 - x - 6$

$$\therefore |x^2 - x - 6| = x + 2$$

$$\Rightarrow (x + 2)(x - 3) = x + 2$$

$$\Rightarrow (x - 3) = 1 \Rightarrow \boxed{x = 4}$$

Hence, the root are  $-2$ ,  $2$ , and  $4$ .

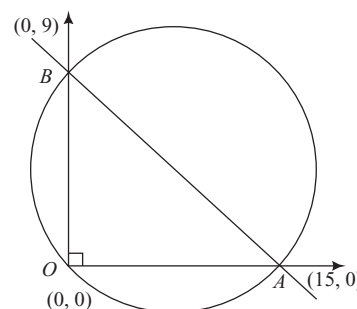
$$\therefore \text{Required product} = (2)(-2)(4) = -16$$

87. (9) Clearly, the triangle will be right angled triangle and its hypotenuse would be the diameter of its circumcircle.  
 Given equation,  $3x + 5y - 45 = 0$

When  $y = 0$ , Then  $x = 15$

When  $x = 0$ , Then  $y = 9$

Hence,  $A(15, 0)$  and  $B(0, 9)$  and  $O(0, 0)$  are the vertices of the right triangle formed whose hypotenuse is the diameter of the  $\Delta OAB$ .



$$AB = \sqrt{9^2 + 15^2} = \sqrt{306} \approx 17.5$$

$$\therefore \text{Now, Radius(L)} = \frac{\text{Diameter}}{2} = \frac{AB}{2} = \frac{17.5}{2} \approx 8.7$$

Hence, the integer closest to  $L = 9$ .

88. (13) Let one machine completes 1 unit of work per day.

Since, two machines can finish the job in 13 days

$$\therefore \text{Amount of work} = 2 \times 1 \times 13 = 26 \text{ units.}$$

Also, let a man completes  $M$  units of work per day.

From the given conditions

$$3M + 8 \times 1 = 2(8M + 3 \times 1) \Rightarrow M = \frac{2}{13} \text{ units}$$

Let it require ' $x$ ' number of men to complete the work in 13 days.

$$xM \times 13 = 26 \text{ units} \Rightarrow x \times \frac{2}{13} \times 13 = 26 \Rightarrow x = 13$$

hence, required number of men = 13.

89. (9) Let the amount invested in fixed deposit be  $x$  lakhs.

According to the question,

$$x \times \frac{6}{100} + \frac{2}{3} \times (15 - x) \times \frac{4}{100} + \frac{1}{3} \times (15 - x) \times \frac{3}{100}$$



$$= \frac{76000}{10^5}$$

$$\Rightarrow 6x - \frac{8}{3}x - x = 76 - \frac{8}{3} \times 15 - 15$$

$$\Rightarrow \frac{7}{3}x = \frac{76 \times 3 - 11 \times 15}{3} \Rightarrow \frac{7}{3}x = \frac{63}{3} \Rightarrow x = 9$$

Hence the amount (in lakh) invested in fixed deposits = 9.

90. (20) Percentage of girls = 60%

$\therefore$  Percentage of boys = 40%

Hence, we can suppose number of girls and boys be  $3x$  and  $2x$  respectively.

$$\text{Given, } 3x - 2x = 30 \Rightarrow x = 30$$

Hence, the number of students =  $3x + 2x = 5x = 5 \times 30 = 150$

Number of girls =  $3x = 90$

Number of boys =  $2x = 60$

Now, number of students who pass the exam = 68% of 150 = 102

Number of girls pass the exam =  $102 - 30 = 72$

Therefore, number of girls who do not pass (i.e. failed) in the exam =  $90 - 72 = 18$

Hence, percentage of girls who do not pass (i.e. failed) in the exam =  $\frac{18}{90} \times 100 = 20$

91. (b) Given:  $2 \cos(x(x+1)) = 2^x + 2^{-x}$

Now, by AM - GM inequality, we get

$$\frac{2^x + 2^{-x}}{2} \geq \sqrt{2^x \times 2^{-x}}$$

$$\Rightarrow 2^x + 2^{-x} \geq 2\sqrt{2^0} \Rightarrow 2^x + 2^{-x} \geq 2$$

$$\therefore 2 \cos(x(x+1)) \geq 2$$

We know,  $-1 \leq \cos \theta \leq 1$

$$\therefore 2 \cos(x(x+1)) = 2$$

Hence, the expression is valid only if  $2^x + 2^{-x} = 2$ , which is true for only one value of  $x$  i.e. 0.

Therefore, the expression has only one real solution.

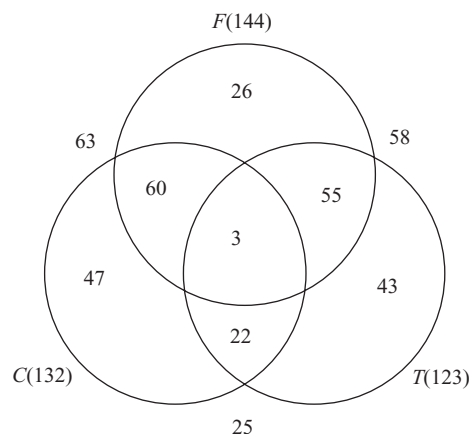
92. (d) Let the number of members playing all three games be  $x$ .

Given, that all the members play at least one of these three games, hence

$$n(F \cup T \cup C) = n(F) + n(T) + n(C) - n(F \cap T) - n(T \cap C) - n(C \cap F) + n(F \cap T \cap C)$$

$$\Rightarrow 256 = 144 + 123 + 132 - (58 + 25 + 63) + x \Rightarrow x = 3$$

Fitting the numbers in the venn diagram, we get



Clearly, the number of members playing only tennis = 43.

93. (10) Case 1:  $m$  is even

$$\text{Given, } 8f(m+1) - f(m) = 2$$

$$\Rightarrow 8(m+1+3) - m(m+1) = 2$$

$$\Rightarrow 8m + 32 - m^2 - m = 2$$

$$\Rightarrow m^2 - 7m - 30 = 0$$

$$\Rightarrow (m-10)(m+3) = 0$$

$$\Rightarrow m = 10 \text{ or } -3$$

As  $m$  is a positive integer, therefore  $m = 10$ .

Case 2:

If  $m$  is odd, then

$$8f(m+1) - f(m) = 2$$

$$\Rightarrow 8(m+1)(m+2) - (m+3) = 2$$

$$\Rightarrow 8(m^2 + 3m + 2) - m - 3 = 2$$

$$\Rightarrow 8m^2 + 24m + 16 - m - 3 = 2$$

$$\Rightarrow 8m^2 + 23m + 11 = 0,$$

Which is not possible and hence no solution.

94. (d) Let the two numbers be  $x$  and  $y$

$$\therefore x \times y = 616$$

$$\text{and } \frac{x^3 - y^3}{(x-y)^3} = \frac{157}{3}$$

$$\text{Now, let } x^3 - y^3 = 157k \text{ and } (x-y)^3 = 3k$$

$$\text{Since, } (x-y)^3 = x^3 - y^3 - 3xy(x-y)$$

$$\therefore 3k = 157k - 3 \times 616(3k)^{1/3}$$

$$\Rightarrow 154k = 3 \times 616 \times (3k)^{1/3} \Rightarrow k = \frac{3 \times 616}{154} \times (3k)^{1/3}$$

$$\Rightarrow k = 12 \times (3k)^{1/3} \Rightarrow k^3 = 12^3 \times 3 \times k$$

$$\Rightarrow k(k^2 - 12^3 \times 3) = 0$$

$$\therefore k \neq 0 \therefore k^2 = 3 \times 12^3 \therefore k = 72$$

$$\Rightarrow x - y = (3k)^{1/3} = (3 \times 72)^{1/3} = 6$$

$$\therefore (x+y)^2 = (x-y)^2 + 4xy$$

$$\therefore (x+y)^2 = 6^2 + 4 \times 616 = 2500$$

$$\Rightarrow x + y = 50$$

Hence, sum of the two numbers = 50

95. (3) Given,

$$f(a+1) + f(a+2) + \dots + f(a+n) = 16(2n-1)$$

$$\Rightarrow f(a)f(1) + f(a)f(2) + \dots + f(a)f(n) = 16(2n-1)$$

$$\Rightarrow f(a)(f(1) + f(2) + \dots + f(n)) = 16(2n-1)$$

When  $n = 1$ , then  $f(a)f(1) = 16(2^1 - 1) = 16$

$$\Rightarrow f(a) \times 2 = 16 \Rightarrow f(a) = 8$$

$$\therefore f(a)(f(1) + f(2) + \dots + f(n)) = 16(2n - 1)$$

$$\Rightarrow f(1) + f(2) + \dots + f(n) = 2(2n - 1)$$

When  $n = 2$ , then  $f(1) + f(2) = 2(2^2 - 1) = 6$

$$\Rightarrow f(2) = 6 - f(1) = 6 - 2 = 4$$

When  $n = 3$ , then  $f(1) + f(2) + f(3) = 2(2^3 - 1) = 14$

$$\Rightarrow f(3) = 14 - f(1) - f(2) = 14 - 2 - 4 = 8 = f(a)$$

$$\therefore a = 3$$

96. (d) Let the income of Bimala be ₹100

Then Amla's income =  $1.2 \times 100 = ₹120$

$$\text{and Amla's income} = \frac{80}{100} \times \text{Kamla's income}$$

$$= \frac{4}{5} \times \text{Kamla's income}$$

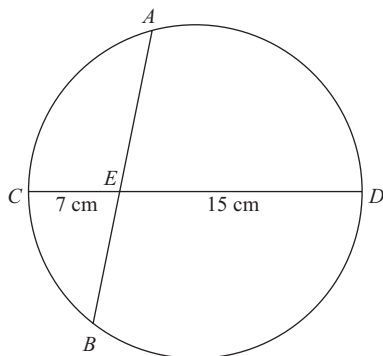
$$\text{Therefore, Kamla's income} = \frac{5}{4} \times 120 = ₹150$$

Now, Kamala's new income with 4% decrease =  $0.96 \times 150 = ₹144$

and Bimala's new income with 10% increase =  $1.1 \times 100 = ₹110$

$$\therefore \text{Required percentage increase} = \left( \frac{144 - 110}{110} \right) \times 100 = 31\%$$

97. (d)



In the figure,  $AB$  and  $CD$  are two chords of a circle, intersects each other at point  $E$ .

$$\therefore AE \times BE = CE \times DE$$

$$\Rightarrow AE \times BE = 7 \times 15 = 105$$

$$(AE - BE)^2 = (AE + BE)^2 - 4 \times AE \times BE = (AB)^2 - 4 \times 105$$

$$\Rightarrow (AE - BE)^2 = (20.5)^2 - 420$$

$$\Rightarrow (AE - BE)^2 = 420.25 - 420 = 0.25$$

$$\Rightarrow AE - BE = 0.5$$

98. (c) Let the cost prices of a pen and a books be  $x$  and  $y$  respectively.

From 1st given condition,

$$0.95x + 1.15y = x + y + 7$$

$$\Rightarrow 95x + 115y = 100x + 100y + 700$$

$$\Rightarrow 5x - 15y = -700$$

$$\Rightarrow x - 3y = -140 \quad \dots(i)$$

From 2nd given condition,

$$1.05x + 1.1y = x + y + 13$$

$$\Rightarrow 105x + 110y = 100x + 100y + 1300$$

$$\Rightarrow 21x + 22y = 20x + 20y + 260$$

$$\Rightarrow x + 2y = 260 \quad \dots(ii)$$

On subtracting equation (ii) from (i), we get

$$-5y = -400 \Rightarrow y = 80$$

99. (d) We can transform each of the options for 'n' years.

$$(997)2^{14} + 3 \equiv (p - 3)2n - 1 + 3$$

$$(997)^{15} - 3 \equiv (p - 3)n - 3$$

$$(1003)^{15} + 6 \equiv (p + 3)^n + 6$$

$$(1003)2^{15} - 3 \equiv (p + 3)2n - 3$$

As per the condition, in one year, the population 'p' becomes '3 + 2p'

Putting the value of  $n = 1$  in each option, and checking to get  $3 + 2p$ , we have

$$(997)2^{14} + 3 \equiv p \neq 3 + 2p$$

$$(1003)^{15} + 6 \equiv p + 9 \neq 3 + 2p$$

$$(1003)2^{15} - 3 \equiv (p + 3)2n - 3 = 3 + 2p$$

$$(997)^{15} - 3 \equiv (p - 3) - 3 \equiv p - 6$$

100. (c)  $(\sqrt{2})^{19} 3^4 4^2 9^m 8^n = 3^n 16^m (\sqrt[4]{64})$

$$\Rightarrow 2^{19/2} \times 3^4 \times 2^4 \times 3^2 m \times 2^3 n = 3^n \times 2^4 m \times 2^{3/2}$$

$$\Rightarrow 2^{(19/2 + 4 + 3n)} \times 3^{(4 + 2m)} = 2^{(4m + \frac{3}{2})} \times 3^n$$

On comparing the powers of same bases from both side, we get

$$\frac{19}{2} + 4 + 3n = 4m + \dots$$

$$\Rightarrow 3n = 4m + \frac{3}{2} - \frac{19}{2} - 4$$

$$\Rightarrow 3n = 4m + \frac{3 - 19 - 8}{2}$$

$$\Rightarrow n = \frac{4}{3}m - \frac{24}{6}$$

$$\Rightarrow n = \frac{4}{3}m - 4 \quad \dots(i)$$

$$4 + 2m = n \quad \dots(ii)$$

From equation (i) and (ii), we get

$$\frac{4}{3}m - 4 = 4 + 2m$$

$$\Rightarrow 2m - \frac{4}{3}m = -8$$

$$\Rightarrow \frac{6m - 4m}{3} = -8$$

$$\Rightarrow 2m = -24$$

$$\therefore m = -12$$

# CAT SOLVED PAPER-2019

## (SLOT-II)

Test Date: 24/11/2019

Test Time: 2:30 PM - 5:30 PM

### SECTION : VERBAL ABILITY

**DIRECTIONS for the questions:** Read the passage and answer the questions (1-5) based on it.

British colonial policy . . . went through two policy phases, or at least there were two strategies between which its policies actually oscillated, sometimes to its great advantage. At first, the new colonial apparatus exercised caution, and occupied India by a mix of military power and subtle diplomacy, the high ground in the middle of the circle of circles. This, however, pushed them into contradictions. For, whatever their sense of the strangeness of the country and the thinness of colonial presence, the British colonial state represented the great conquering discourse of Enlightenment rationalism, entering India precisely at the moment of its greatest unchecked arrogance. As inheritors and representatives of this discourse, which carried everything before it, this colonial state could hardly adopt for long such a self-denying attitude. It had restructured everything in Europe—the productive system, the political regimes, the moral and cognitive orders—and would do the same in India, particularly as some empirically inclined theorists of that generation considered the colonies a massive laboratory of utilitarian or other theoretical experiments. Consequently, the colonial state could not settle simply for eminence at the cost of its marginality; it began to take initiatives to introduce the logic of modernity into Indian society. But this modernity did not enter a passive society. Sometimes, its initiatives were resisted by pre-existing structural forms. At times, there was a more direct form of collective resistance. Therefore the map of continuity and discontinuity that this state left behind at the time of independence was rather complex and has to be traced with care.

Most significantly, of course, initiatives for . . . modernity came to assume an external character. The acceptance of modernity came to be connected, ineradicably, with subjection. This again points to two different problems, one theoretical, the other political. Theoretically, because modernity was externally introduced, it is explanatorily unhelpful to apply the logical format of the transition process' to this pattern of change. Such a logical format would be wrong on two counts. First, however subtly, it would imply that what was proposed to be built was something like European capitalism. (And, in any case, historians have forcefully argued that what it was to replace was not like feudalism, with or without modificatory adjectives.) But, more fundamentally, the logical structure of endogenous change does not apply here. Here transformation agendas attack as an external force. This externality

is not something that can be casually mentioned and forgotten. It is inscribed on every move, every object, every proposal, every legislative act, each line of causality. It comes to be marked on the epoch itself. This repetitive emphasis on externality should not be seen as a nationalist initiative that is so well rehearsed in Indian social science. . . .

Quite apart from the externality of the entire historical proposal of modernity, some of its contents were remarkable. . . . Economic reforms, or rather alterations . . . did not foreshadow the construction of a classical capitalist economy, with its necessary emphasis on extractive and transport sectors. What happened was the creation of a degenerate version of capitalism—what early dependency theorists called the 'development of underdevelopment'.

1. Which of the following observations is a valid conclusion to draw from the author's statement that "the logical structure of endogenous change does not apply here. Here transformation agendas attack as an external force"?
  - (a) Colonised societies cannot be changed through logic; they need to be transformed with external force.
  - (b) The transformation of Indian society did not happen organically but was forced by colonial agendas.
  - (c) Indian society is not endogenous; it is more accurately characterised as aggressively exogamous.
  - (d) The endogenous logic of colonialism can only bring change if it attacks and transforms external forces.
2. "Consequently, the colonial state could not settle simply for eminence at the cost of its marginality; it began to take initiatives to introduce the logic of modernity into Indian society." Which of the following best captures the sense of this statement?
  - (a) The cost of the colonial state's eminence was not settled; therefore, it took the initiative of introducing modernity into Indian society.
  - (b) The colonial enterprise was a costly one; so to justify the cost it began to take initiatives to introduce the logic of modernity into Indian society.
  - (c) The colonial state's eminence was unsettled by its marginal position; therefore, it developed Indian society by modernising it.
  - (d) The colonial state felt marginalised from Indian society because of its own modernity, therefore it sought to address that marginalisation by bringing its modernity to change Indian society.

3. All of the following statements, if true, could be seen as supporting the arguments in the passage, EXCEPT:
  - (a) the change in British colonial policy was induced by resistance to modernity in Indian society.
  - (b) modernity was imposed upon India by the British and therefore, led to underdevelopment.
  - (c) throughout the history of colonial conquest, natives have often been experimented on by the colonisers.
  - (d) the introduction of capitalism in India was not through the transformation of feudalism, as happened in Europe.
4. All of the following statements about British colonialism can be inferred from the first paragraph, EXCEPT that it:
  - (a) allowed the treatment of colonies as experimental sites.
  - (b) faced resistance from existing structural forms of Indian modernity.
  - (c) was at least partly shaped by the project of European modernity.
  - (d) was at least partly an outcome of Enlightenment rationalism.
5. Which one of the following 5-word sequences best captures the flow of the arguments in the passage?
  - (a) Colonial policy—arrogant rationality—resistance— independence—development.
  - (b) Military power—colonialism—restructuring—feudalism—capitalism.
  - (c) Military power—arrogance—laboratory—modernity— capitalism.
  - (d) Colonial policy— enlightenment—external modernity— subjection— underdevelopment.

**DIRECTIONS for the questions:** Read the passage and answer the questions (6-10) based on it.

War, natural disasters and climate change are destroying some of the world's most precious cultural sites. Google is trying to help preserve these archaeological wonders by allowing users access to 3D images of these treasures through its site.

But the project is raising questions about Google's motivations and about who should own the digital copyrights. Some critics call it a form of "digital colonialism."

When it comes to archaeological treasures, the losses have been mounting. ISIS blew up parts of the ancient city of Palmyra in Syria and an earthquake hit Bagan, an ancient city in Myanmar, damaging dozens of temples, in 2016. In the past, all archaeologists and historians had for restoration and research were photos, drawings, remnants and intuition.

But that's changing. Before the earthquake at Bagan, many of the temples on the site were scanned. . . . [These] scans . . . are on Google's Arts & Culture site. The digital renditions allow viewers to virtually wander the halls of the temple, look up-close at paintings and turn the building over, to look up at its chambers. [Google Arts & Culture] works with museums and other nonprofits . . . to put high-quality images online.

The images of the temples in Bagan are part of a collaboration with CyArk, a nonprofit that creates the 3D scanning of historic sites. . . . Google . . . says [it] doesn't make money off this website, but it fits in with Google's mission to make the world's information available and useful.

Critics say the collaboration could be an attempt by a large corporation to wrap itself in the sheen of culture. Ethan Watrall, an archaeologist, professor at Michigan State University and a member of the Society for American Archaeology, says he's not comfortable with the arrangement between CyArk and Google. . . . Watrall says this project is just a way for Google to promote Google. "They want to make this material accessible so people will browse it and be filled with wonder by it," he says. "But at its core, it's all about advertisements and driving traffic." Watrall says these images belong on the site of a museum or educational institution, where there is serious scholarship and a very different mission. . . .

[There's] another issue for some archaeologists and art historians. CyArk owns the copyrights of the scans — not the countries where these sites are located. That means the countries need CyArk's permission to use these images for commercial purposes.

Erin Thompson, a professor of art crime at John Jay College of Criminal Justice in New York City, says it's the latest example of a Western nation appropriating a foreign culture, a centuries-long battle. . . . CyArk says it copyrights the scans so no one can use them in an inappropriate way. The company says it works closely with authorities during the process, even training local people to help. But critics like Thompson are not persuaded. . . . She would prefer the scans to be owned by the countries and people where these sites are located.

6. Of the following arguments, which one is LEAST likely to be used by the companies that digitally scan cultural sites?
  - (a) It provides images free of cost to all users.
  - (b) It helps preserve precious images in case the sites are damaged or destroyed.
  - (c) It allows a large corporation to protect itself as a protector of culture.
  - (d) It enables people who cannot physically visit these sites to experience them.
7. Based on his views mentioned in the passage, one could best characterise Dr. Watrall as being:
  - (a) dismissive of laypeople's access to specialist images of archaeological and cultural sites.
  - (b) opposed to the use of digital technology in archaeological and cultural sites in developing countries.
  - (c) uneasy about the marketing of archaeological images for commercial use by firms such as Google and CyArk.
  - (d) critical about the links between a non-profit and a commercial tech platform for distributing archaeological images.
8. By "digital colonialism", critics of the CyArk-Google project are referring to the fact that:
  - (a) countries where the scanned sites are located do not own the scan copyrights.
  - (b) CyArk and Google have not shared the details of digitisation with the host countries.
  - (c) the scanning process can damage delicate frescos and statues at the sites.
  - (d) CyArk and Google have been scanning images without copyright permission from host countries.



9. In Dr. Thompson's view, CyArk owning the copyright of its digital scans of archaeological sites is akin to:
- (a) the illegal downloading of content from the internet.
  - (b) the seizing of ancient Egyptian artefacts by a Western museum.
  - (c) tourists uploading photos of monuments onto social media.
  - (d) digital platforms capturing users' data for market research.
10. Which of the following, if true, would most strongly invalidate Dr. Watrall's objections?
- (a) CyArk unloads its scanned images of archaeological sites onto museum websites only.
  - (b) There is a ban on Cyark scanning archeological sites located in other countries.
  - (c) CyArk does not own the copyright on scanned images of archaeological sites.
  - (d) Google takes down advertisements on its website hosting CyArk's scanned images.

**DIRECTIONS for the questions:** Read the passage and answer the questions (11-15) based on it.

The magic of squatter cities is that they are improved steadily and gradually by their residents. To a planner's eye, these cities look chaotic. I trained as a biologist and to my eye, they look organic. Squatter cities are also unexpectedly green. They have maximum density—1 million people per square mile in some areas of Mumbai—and have minimum energy and material use. People get around by foot, bicycle, rickshaw, or the universal shared taxi.

Not everything is efficient in the slums, though. In the Brazilian favelas where electricity is stolen and therefore free, people leave their lights on all day. But in most slums recycling is literally a way of life. The Dharavi slum in Mumbai has 400 recycling units and 30,000 ragpickers. Six thousand tons of rubbish are sorted every day. In 2007, the Economist reported that in Vietnam and Mozambique. "Waves of gleaners sift the sweepings of Hanoi's streets, just as Mozambiquan children pick over the rubbish of Maputo's main tip. Every city in Asia and Latin America has an industry based on gathering up old cardboard boxes." . . .

In his 1985 article, Calthorpe made a statement that still jars with most people: "The city is the most environmentally benign form of human settlement. Each city dweller consumes less land, less energy, less water, and produces less pollution than his counterpart in settlements of lower densities." "Green Manhattan" was the inflammatory title of a 2004 New Yorker article by David Owen. "By the most significant measures," he wrote. "New York is the greenest community in the United States, and one of the greenest cities in the world . . . The key to New York's relative environmental benignity is its extreme compactness. . . . Placing one and a half million people on a twenty-three-square-mile island sharply reduces their opportunities to be wasteful." He went on to note that this very compactness forces people to live in the world's most energy-efficient apartment buildings. . . .

Urban density allows half of humanity to live on 2.8 per cent of the land. . . . Consider just the infrastructure efficiencies. According

to a 2004 UN report: "The concentration of population and enterprises in urban areas greatly reduces the unit cost of piped water, sewers, drains, roads, electricity, garbage collection, transport, health care, and schools." . . .

[T]he nationally subsidised city of Manaus in northern Brazil "answers the question" of how to stop deforestation: give people decent jobs. Then they can afford houses, and gain security. One hundred thousand people who would otherwise be deforesting the jungle around Manaus are now prospering in town making such things as mobile phones and televisions. . . .

Of course, fast-growing cities are far from an unmitigated good. They concentrate crime, pollution, disease and injustice as much as business, innovation, education and entertainment. . . . But if they are overall a net good for those who move there, it is because cities offer more than just jobs. They are transformative: in the slums, as well as the office towers and leafy suburbs, the progress is from hick to metropolitan to cosmopolitan . . .

11. Which one of the following statements would undermine the author's stand regarding the greenness of cities?
- (a) The compactness of big cities in the West increases the incidence of violent crime.
  - (b) The high density of cities leads to an increase in carbon dioxide and global warming.
  - (c) Over the last decade the cost of utilities has been increasing for city dwellers.
  - (d) Sorting through rubbish contributes to the rapid spread of diseases in the slums.
12. According to the passage, squatter cities are environment-friendly for all of the following reasons EXCEPT:
- (a) they recycle material.
  - (b) their transportation is energy efficient.
  - (c) they sort out garbage.
  - (d) their streets are kept clean.
13. We can infer that Calthorpe's statement "still jars" with most people because most people:
- (a) do not regard cities as good places to live in.
  - (b) consider cities to be very crowded and polluted.
  - (c) regard cities as places of disease and crime.
  - (d) do not consider cities to be eco-friendly places.
14. From the passage it can be inferred that cities are good places to live in for all of the following reasons EXCEPT that they:
- (a) help prevent destruction of the environment.
  - (b) have suburban areas as well as office areas.
  - (c) offer employment opportunities.
  - (d) contribute to the cultural transformation of residents.
15. In the context of the passage, the author refers to Manaus in order to:
- (a) explain where cities source their labour for factories.
  - (b) promote cities as employment hubs for people.
  - (c) explain how urban areas help the environment.
  - (d) describe the infrastructure efficiencies of living in a city.

**DIRECTIONS for the questions:** Read the passage and answer the questions (16-19) based on it.

For two years, I tracked down dozens of . . . Chinese in upper Egypt [who were] selling lingerie. In a deeply conservative region, where Egyptian families rarely allow women to work or own businesses, the Chinese flourished because of their status as outsiders. They didn't gossip, and they kept their opinions to themselves. In a New Yorker article entitled "Learning to Speak Lingerie," I described the Chinese use of Arabic as another non-threatening characteristic. I wrote, "Unlike Mandarin. Arabic is inflected for gender, and Chinese dealers, who learn the language strictly by ear, often pick up speech patterns from female customers. I've come to think of it as the lingerie dialect, and there's something disarming about these Chinese men speaking in the feminine voice." . . .

When I wrote about the Chinese in the New Yorker, most readers seemed to appreciate the unusual perspective. But as I often find with topics that involve the Middle East, some people had trouble getting past the black-and-white quality of a byline. "This piece is so orientalist I don't know what to do," Aisha Gani, a reporter who worked at The Guardian, tweeted. Another colleague at the British paper, Iman Amrani, agreed: "I wouldn't have minded an article on the subject written by an Egyptian woman—probably would have had better insight." . . .

As an MOL (man of language). I also take issue with this kind of essentialism. Empathy and understanding are not inherited traits, and they are not strictly tied to gender and race. An individual who wrestles with a difficult language can learn to be more sympathetic to outsiders and open to different experiences of the world. This learning process—the embarrassments, the frustrations, the gradual sense of understanding and connection—is invariably transformative. In Upper Egypt, the Chinese experience of struggling to learn Arabic and local culture had made them much more thoughtful. In the same way. I was interested in their lives not because of some kind of voyeurism, but because I had also experienced Egypt and Arabic as an outsider. And both the Chinese and the Egyptians welcomed me because I spoke their languages. My identity as a white male was far less important than my ability to communicate.

And that easily lobbed word—"Orientalist"—hardly captures the complexity of our interactions. What exactly is the dynamic when a man from Missouri observes a Zhejiang native selling lingerie to an Upper Egyptian woman? . . . If all of us now stand beside the same river, speaking in ways we all understand, who's looking east and who's looking west? Which way is Oriental?

For all of our current interest in identity politics, there's no corresponding sense of identity linguistics. You are what you speak—the words that run throughout your mind are at least as fundamental to your selfhood as is your ethnicity or your gender. And sometimes it's healthy to consider human characteristics that are not inborn, rigid, and outwardly defined. After all, you can always learn another language and change who you are.

16. A French ethnographer decides to study the culture of a Nigerian tribe. Which of the following is most likely to be the view of the author of the passage?
- (a) The author would discourage the ethnographer from conducting the study as Nigerian ethnographers can better understand the tribe.

- (b) The author would encourage the ethnographer and recommend him/her to hire a good translator for the purpose of holding interviews.
- (c) The author would encourage the ethnographer, but ask him/her to first learn the language of the Nigerian tribe s/he wishes to study.
- (d) The author would encourage the ethnographer, but ask him/her to be mindful of his/her racial and gender identity in the process.

17. According to the passage, which of the following is not responsible for language's ability to change us?
- (a) Language's intrinsic connection to our notions of self and identity.
- (b) Language's ability to mediate the impact of identity markers one is born with.
- (c) The twists and turns in the evolution of language over time.
- (d) The ups and downs involved in the course of learning a language.
18. Which of the following can be inferred from the author's claim, "Which way is Oriental?"
- (a) Goodwill alone mitigates cultural hierarchies and barriers.
- (b) Learning another language can mitigate cultural hierarchies and barriers.
- (c) Globalisation has mitigated cultural hierarchies and barriers.
- (d) Orientalism is a discourse of the past from colonial times, rarely visible today.
19. The author's critics would argue that:
- (a) Linguistic politics can be erased.
- (b) Empathy can overcome identity politics.
- (c) Language is insufficient to bridge cultural barriers.
- (d) Orientalism cannot be practiced by Egyptians.

**DIRECTIONS for the questions:** Read the passage and answer the questions (20-24) based on it.

Around the world, capital cities are disgorging bureaucrats. In the post-colonial fervour of the 20th century, coastal capitals picked by trade-focused empires were spurned for "regionally neutral" new ones .... But decamping wholesale is costly and unpopular: governments these days prefer piecemeal dispersal. The trend reflects how the world has changed. In past eras, when information travelled at a snail's pace, civil servants had to cluster together. But now desk-workers can ping emails and video-chat around the world. Travel for face-to-face meetings may be unavoidable, but transport links, too, have improved. . . .

Proponents of moving civil servants around promise countless benefits. It disperses the risk that a terrorist attack or natural disaster will cripple an entire government. Wonks in the sticks will be inspired by new ideas that walled-off capitals cannot conjure up. Autonomous regulators perform best far from the pressure and lobbying of the big city. Some even hail a cure for ascendant cynicism and populism. The unloved bureaucrats of faraway capitals will become as popular as firefighters once they mix with regular folk.

Beyond these sunny visions, dispersing central-government functions usually has three specific aims: to improve the lives of both civil servants and those living in clogged capitals; to save

money; and to redress regional imbalances. The trouble is that these goals are not always realised.

The first aim—improving living conditions—has a long pedigree. After the second world war Britain moved thousands of civil servants to “agreeable English country towns” as London was rebuilt. But swapping the capital for somewhere smaller is not always agreeable. Attrition rates can exceed 80%. . . . The second reason to pack bureaucrats off is to save money. Office space costs far more in capitals. . . . Agencies that are moved elsewhere can often recruit better workers on lower salaries than in capitals, where well-paying multinationals mop up talent.

The third reason to shift is to rebalance regional inequality. . . . Norway treats federal jobs as a resource every region deserves to enjoy, like profits from oil. Where government jobs go, private ones follow. . . . Sometimes the aim is to fulfil the potential of a country’s second-tier cities. Unlike poor, remote places, bigger cities can make the most of relocated government agencies, linking them to local universities and businesses and supplying a better-educated workforce. The decision in 1946 to set up America’s Centres for Disease Control in Atlanta rather than Washington, D.C., has transformed the city into a hub for health-sector research and business.

The dilemma is obvious. Pick small, poor towns, and areas of high unemployment get new jobs, but it is hard to attract the most qualified workers: opt for larger cities with infrastructure and better-qualified residents, and the country’s most deprived areas see little benefit. . . . Others contend that decentralisation begets corruption by making government agencies less accountable. . . . A study in America found that state-government corruption is worse when the state capital is isolated—journalists, who tend to live in the bigger cities, become less watchful of those in power.

20. The “long pedigree” of the aim to shift civil servants to improve their living standards implies that this move:
- takes a long time to achieve its intended outcomes.
  - has become common practice in several countries worldwide.
  - is supported by politicians and the ruling elites.
  - is not a new idea and has been tried in the past.
21. The “dilemma” mentioned in the passage refers to:
- relocating government agencies to boost growth in remote areas with poor amenities or to relatively larger cities with good amenities.
  - keeping government agencies in the largest city with good infrastructure or moving them to a remote area with few amenities.
  - concentrating on decongesting large cities or focusing on boosting employment in relatively larger cities.
  - encouraging private enterprises to relocate to smaller towns or not incentivising them in order to keep government costs in those towns low.
22. People who support decentralising central government functions are LEAST likely to cite which of the following reasons for their view?
- It reduces expenses as infrastructure costs and salaries are lower in smaller cities.
  - Policy makers may benefit from fresh thinking in a new environment.

- More independence could be enjoyed by regulatory bodies located away from political centres.
- It could weaken the nexus between bureaucrats and media in the capital.

23. According to the passage, colonial powers located their capitals:
- based on political expediency.
  - to promote their trading interests.
  - where they had the densest populations.
  - to showcase their power and prestige.
24. According to the author, relocating government agencies has not always been a success for all of the following reasons EXCEPT:
- high staff losses, as people may not be prepared to move to smaller towns.
  - the difficulty of attracting talented, well-skilled people in more remote areas.
  - increased avenues of corruption away from the capital city.
  - a rise in pollution levels and congestion in the new locations.

**DIRECTIONS for the questions:** *The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.*

25. (a) Such a belief in the harmony of nature requires a purpose presumably imposed by the goodness and wisdom of a deity.  
 (b) These parts, all fit together into an integrated, well-ordered system that was created by design.  
 (c) Historically, the notion of a balance of nature is part observational, part metaphysical, and not scientific in any way.  
 (d) It is an example of an ancient belief system called teleology, the notion that what we call nature has a predetermined destiny associated with its component parts.

**DIRECTIONS for the questions:** *The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.*

26. (a) Conceptualisations of ‘women’s time’ as contrary to clock-time and clock-time as synonymous with economic rationalism are two of the deleterious results of this representation.  
 (b) While dichotomies of ‘men’s time’, ‘women’s time’, clock-time, and caring time can be analytically useful, this article argues that everyday caring practices incorporate a multiplicity of times; and both men and women can engage in these multiple-times  
 (c) When the everyday practices of working sole fathers and working sole mothers are carefully examined to explore conceptualisations of gendered time, it is found that caring time is often more focused on the clock than generally theorised.  
 (d) Clock-time has been consistently represented in feminist literature as a masculine artefact representative of a ‘time is money’ perspective.



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

Privacy-challenged office workers may find it hard to believe, but open-plan offices and cubicles were invented by architects and designers who thought that to break down the social walls that divide people, you had to break down the real walls, too. Modernist architects saw walls and rooms as downright fascist. The spaciousness and flexibility of an open plan would liberate homeowners and office dwellers from the confines of boxes. But companies took up their idea less out of a democratic ideology than a desire to pack in as many workers as they could. The typical open-plan office of the first half of the 20th century was a white-collar assembly line. Cubicles were interior designers' attempt to put some soul back in.

27. (a) Wall-free office spaces did not quite work out the way then utopian inventors intended, as they became tools for exploitation of labor.  
 (b) Wall-free office spaces could have worked out the way their utopian inventors intended had companies cared for workers' satisfaction.  
 (c) Wall-free office spaces did not quite work out as desired and therefore cubicles came into being.  
 (d) Wall-free office spaces did not quite work out as companies don't believe in democratic ideology.

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

Language is an autapomorphy found only in our lineage, and not shared with other branches of our group such as primates. We also have no definitive evidence that any species other than *Homo sapiens* ever had language. However, it must be noted straightaway that 'language' is not a monolithic entity, but rather a complex bundle of traits that must have evolved over a significant time frame.... Moreover, language crucially draws on aspects of cognition that are long established in the primate lineage, such as memory: the language faculty as a whole comprises more than just the uniquely linguistic features.

28. (a) Language, a derived trait found only in humans, has evolved over time and involves memory.  
 (b) language evolved with linguistic features building on features of cognition such as memory.  
 (c) Language is not a single, uniform entity but the end result of a long and complex process of linguistic evolution.  
 (d) Language is a distinctively human feature as there is no evidence of the existence of language in any other species.

**DIRECTIONS for the questions:** *Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out.*

*Choose its number as your answer and key it in.*

29. (a) Ocean plastic is problematic for a number of reasons, but primarily because marine animals eat it.  
 (b) The largest numerical proportion of ocean plastic falls in small size fractions.

- (c) Aside from clogging up the digestive tracts of marine life, plastic also tends to adsorb pollutants from the water column.  
 (d) Plastic in the oceans is arguably one of the most important and pervasive environmental problems today.  
 (e) Eating plastic has a number of negative consequences such as the retention of plastic particles in the gut for longer periods than normal food particles.

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

Social movement organizations often struggle to mobilize supporters from allied movements in their efforts to achieve critical mass. Organizations with hybrid identities—those whose organizational identities span the boundaries of two or more social movements, issues, or identities—are vital to mobilizing these constituencies. Studies of the post-9/11 U.S. antiwar movement show that individuals with past involvement in non-anti-war movements are more likely to join hybrid organizations than are individuals without involvement in non-anti-war movements. In addition, they show that organizations with hybrid identities occupy relatively more central positions in inter-organizational contact networks within the antiwar movement and thus recruit significantly more participants in demonstrations than do nonhybrid organizations.

- (a) Post 9/11 studies show that people who are involved in non anti-war movements are likely to join hybrid organizations.  
 (b) Movements that work towards social change often find it difficult to mobilize a critical mass of supporters.  
 (c) Hybrid organizations attract individuals that are deeply involved in anti-war movements.  
 (d) Organizations with hybrid identities are able to mobilize individuals with different points of view.

**DIRECTIONS for the questions:** *Five sentences related to a topic are given below in a jumbled order. Four of them form a coherent and unified paragraph. Identify the odd sentence that does not go with the four. Key in the number of the option that you choose.*

31. (a) Socrates told us that 'the unexamined life is not worth living' and that to 'know thyself is the path to true wisdom.'  
 (b) It suggests that you should adopt an ancient rhetorical method favored by the likes of Julius Caesar and known as 'illeism' – or speaking about yourself in the third person.  
 (c) Research has shown that people who are prone to rumination also often suffer from impaired decision making under pressure and are at a substantially increased risk of depression.  
 (d) Simple rumination – the process of churning your concerns around in your head – is not the way to achieve self-realization.  
 (e) The idea is that this small change in perspective can clear your emotional fog, allowing you to see past your biases.



**DIRECTION for the question:** The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.

32. (a) Living things—animals and plants—typically exhibit correlational structure.  
 (b) Adaptive behaviour depends on cognitive economy, treating objects as equivalent.  
 (c) The information we receive from our senses, from the world, typically has structure and order, and is not arbitrary.  
 (d) To categorize an object means to consider it equivalent to other things in that category, and different—along some salient dimension—from things that are not.

**DIRECTION for the questions:** Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

33. (a) A particularly interesting example of inference occurs in many single panel comics.  
 (b) It's the creator's participation and imagination that makes the single-panel comic so engaging and so rewarding.  
 (c) Often, the humor requires you to imagine what happened in the instant immediately before or immediately after the panel you're being shown.  
 (d) To get the joke, you actually have to figure out what some of these missing panels must be.  
 (e) It is as though the cartoonist devised a series of panels to tell the story and has chosen to show you only one - and typically not even the funniest.

**DIRECTION for the question:** The four sentences (labelled a, b, c, d) given below, when properly sequenced would yield a coherent paragraph. Decide on the proper sequence of the order of the sentences and key in the sequence of the four numbers as your answer.

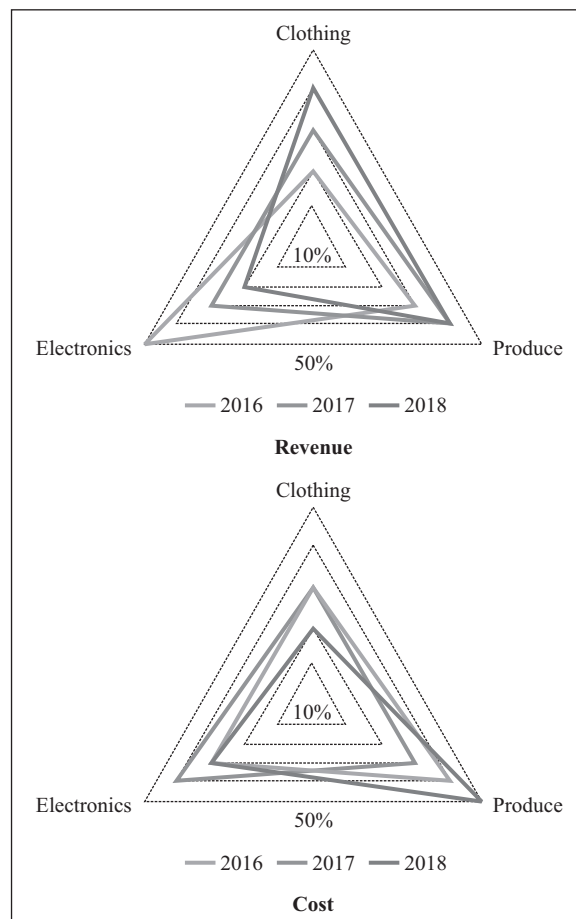
34. (a) To the uninitiated listener, atonal music can sound like chaotic, random noise.  
 (b) A tonality is a condition of music in which the constructs of the music do not 'live' within the confines of a particular key signature, scale, or mode.  
 (c) After you realize the amount of knowledge, skill, and technical expertise required to compose or perform it, your tune may change, so to speak.  
 (d) However, atonality is one of the most important movements in 20th century music.

## SECTION: DI & REASONING

**DIRECTIONS (Qs. 35-38) :** Go through the figure and the information given below and answer the question that follows.

A large store has only three departments, Clothing, Produce, and Electronics. The following figure shows the percentages of revenue and cost from the three departments for the years 2016, 2017 and 2018. The dotted lines depict percentage levels.

So for example, in 2016, 50% of store's revenue came from its Electronics department while 40% of its costs were incurred in the Produce department.



In this setup, Profit is computed as (Revenue – Cost) and Percentage Profit as Profit/Cost  $\times$  100%

**It is known that**

- The percentage profit for the store in 2016 was 100%.
  - The store's revenue doubled from 2016 to 2017, and its cost doubled from 2016 to 2018.
  - There was no profit from the Electronics department in 2017.
  - In 2018, the revenue from the Clothing department was the same as the cost incurred in the Produce department.
35. What was the percentage profit of the store in 2018?
36. What was the ratio of revenue generated from the Produce department in 2017 to that in 2018?  
 (a) 9 : 16 (b) 16 : 9  
 (c) 8 : 5 (d) 4 : 3
37. What percentage of the total profits for the store in 2016 was from the Electronics department?
38. What was the approximate difference in profit percentages of the store in 2017 and 2018?  
 (a) 25.0 (c) 33.3  
 (b) 8.3 (d) 15.5

**DIRECTIONS (Qs. 39-42) :** Read the information given below and answer the question that follows.

The first year students in a business school are split into six sections. In 2019 the Business Statistics course was taught in these six sections by Annie, Beti, Chetan, Dave, Esha, and Fakir. All six sections had a common midterm (MT) and a common endterm (ET) worth 100 marks each. ET contained more questions than MT. Questions for MT and ET were prepared collectively by the six faculty members. Considering MT and ET together, each faculty member prepared the same number of questions.

Each of MT and ET had at least four questions that were worth 5 marks, at least three questions that were worth 10 marks, and at least two questions that were worth 15 marks. In both MT and ET, all the 5-mark questions preceded the 10-mark questions, and all the 15-mark questions followed the 10-mark questions.

**The following additional facts are known.**

- Annie prepared the fifth question for both MT and ET. For MT, this question carried 5 marks.
  - Annie prepared one question for MT. Every other faculty member prepared more than one questions for MT.
  - All questions prepared by a faculty member appeared consecutively in MT as well as ET.
  - Chetan prepared the third question in both MT and ET; and Esha prepared the eighth question in both.
  - Fakir prepared the first question of MT and the last one in ET. Dave prepared the last question of MT and the first one in ET.
39. The second question in ET was prepared by:  
 (a) Esha (b) Beti  
 (c) Chetan (d) Dave
40. How many 5-mark questions were there in MT and ET combined?  
 (a) 12 (b) Cannot be determined  
 (c) 13 (d) 10
41. Who prepared 15-mark questions for MT and ET?  
 (a) Only Dave Esha and Fakir  
 (b) Only Esha and Fakir  
 (c) Only Dave and Fakir  
 (d) Only Beti, Dave, Esha and Fakir
42. Which of the following questions did Beti prepare in ET?  
 (a) Fourth question (b) Seventh question  
 (c) Ninth question (d) Tenth question

**DIRECTIONS (Qs. 43-46) :** Read the information given below and answer the question that follows.

Students in a college are discussing two proposals --

**A:** a proposal by the authorities to introduce dress code on campus, and

**B:** a proposal by the students to allow multinational food franchises to set up outlets on college campus.

A student does not necessarily support either of the two proposals.

In an upcoming election for student union president, there are

two candidates in fray: Sunita and Ragini. Every student prefers one of the two candidates.

A survey was conducted among the students by picking a sample of 500 students. The following information was noted from this survey.

- 250 students supported proposal A and 250 students supported proposal B.
  - Among the 200 students who preferred Sunita as student union president, 80% supported proposal A.
  - Among those who preferred Ragini, 30% supported proposal A.
  - 20% of those who supported proposal B preferred Sunita.
  - 40% of those who did not support proposal B preferred Ragini.
  - Every student who preferred Sunita and supported proposal B also supported proposal A.
  - Among those who preferred Ragini, 20% did not support any of the proposals.
43. Among the students surveyed who supported proposal A, what percentage preferred Sunita for student union president?
44. What percentage of the students surveyed who did not support proposal A preferred Ragini as student union president?
45. What percentage of the students surveyed who supported both proposals A and B preferred Sunita as student union president?  
 (a) 50 (b) 25  
 (c) 20 (d) 40
46. How many of the students surveyed supported proposal B, did not support proposal A and preferred Ragini as student union president?  
 (a) 200 (b) 40  
 (c) 150 (d) 210

**DIRECTIONS (Qs. 47-50) :** Go through the table and the information given below and answer the question that follows.

Three doctor, Dr. Ben, Dr. Kane and Dr. Wayne visit a particular clinic Monday to Saturday to see patients. Dr. Ben sees each patient for 10 minutes and charges ₹ 100/-, Dr. Kane sees each patient for 15 minutes and charges ₹ 200/-, while Dr. Wayne sees each patient for 25 minutes and charges ₹ 300/-.

The clinic has three rooms numbered 1, 2 and 3 which are assigned to the three doctors as per the following table.

Room No.	Monday & Tuesday	Wednesday & Thursday	Friday & Saturday
1	Ben	Wayne	Kane
2	Kane	Ben	Wayne
3	Wayne	Kane	Ben

The clinic is open from 9 a.m. to 11.30 a.m. every Monday to Saturday.

On arrival each patient is handed a numbered token indicating their position in the queue, starting with token number 1 every day. As soon as any doctor becomes free, the next patient in the queue enters that emptied room for consultation. If at any time,

more than one room is free then the waiting patient enters the room with the smallest number. For example, if the next two patients in the queue have token numbers 7 and 8 and if rooms numbered 1 and 3 are free, then patient with token number 7 enters room number 1 and patient with token number 8 enters room number 3.

47. What is the maximum number of patients that the clinic can cater to on any single day?
- (a) 30 (b) 12  
(c) 31 (d) 15
48. The queue is never empty on one particular Saturday. Which of the three doctors would earn the maximum amount in consultation charges on that day?
- (a) Dr. Kane (b) Dr. Wayne  
(c) Dr. Ben (d) Both Dr. Wayne and Dr. Kane
49. Mr. Singh visited the clinic on Monday, Wednesday, and Friday of a particular week, arriving at 8:50 a.m. on each of the three days. His token number was 13 on all three days. On which day was he at the clinic for the maximum duration?
- (a) Same duration on all three days  
(b) Wednesday  
(c) Monday  
(d) Friday
50. On a slow Thursday, only two patients are waiting at 9 a.m. After that two patients keep arriving at exact 15 minute intervals starting at 9:15 a.m. – i.e. at 9:15 a.m., 9:30 a.m., 9:45 a.m. etc. Then the total duration in minutes when all three doctors are simultaneously free is
- (a) 10 (b) 15  
(c) 0 (d) 30

**DIRECTIONS (Qs. 51-54) :** Read the information given below and answer the question that follows.

	column 1	column 2	column 3
row 1			
row 2			
row 3			

	column 1	column 2	column 3
row 1	(2, 4)	(6, 8)	(1, 3)
row 2	(3, 5)	(1, 1)	(6, 20)
row 3	(1, 2)	(1, 2)	(2, 5)

Three pouches (each represented by a filled circle) are kept in each of the nine slots in a  $3 \times 3$  grid, as shown in the figure. Every pouch has a certain number of one-rupee coins. The minimum and maximum amounts of money (in rupees) among the three pouches in each of the nine slots are given in the table. For example, we know that among the three pouches kept in the second column of the first row, the minimum amount in a pouch is Rs. 6 and the maximum amount is Rs. 8.

There are nine pouches in any of the three columns, as well as in any of the three rows. It is known that the average amount of money (in rupees) kept in the nine pouches in any column or in any row is an integer. It is also known that the total amount of money kept in the three pouches in the first column of the third row is Rs. 4.

51. What is the total amount of money (in rupees) in the three pouches kept in the first column of the second row?
52. How many pouches contain exactly one coin?
53. What is the number of slots for which the average amount (in rupees) of its three pouches is an integer?
54. The number of slots for which the total amount in its three pouches strictly exceeds Rs. 10 is

**DIRECTIONS (Qs. 55-58) :** Go through the table and the information given below and answer the question that follows.

Ten players, as listed in the table below, participated in a rifle shooting competition comprising of 10 rounds. Each round had 6 participants. Players numbered 1 through 6 participated in Round 1, players 2 through 7 in Round 2, . . . , players 5 through 10 in Round 5, players 6 through 10 and 1 in Round 6, players 7 through 10, 1 and 2 in Round 7 and so on.

The top three performances in each round were awarded 7, 3 and 1 points respectively. There were no ties in any of the 10 rounds. The table below gives the total number of points obtained by the 10 players after Round 6 and Round 10.

Player No.	Player Name	Points after Round 6	Points after Round 10
1	Amita	8	18
2	Bala	2	5
3	Chen	3	6
4	David	6	6
5	Eric	3	10
6	Fatima	10	10
7	Gordon	17	17
8	Hansa	1	4
9	Ikea	2	17
10	Joshin	14	17

The following information is known about Rounds 1 through 6:

- Gordon did not score consecutively in any two rounds.
- Eric and Fatima both scored in a round.

The following information is known about Rounds 7 through 10:

- Only two players scored in three consecutive rounds. One of them was Chen. No other player scored in any two consecutive rounds.
- Joshin scored in Round 7, while Amita scored in Round 10.
- No player scored in all the four rounds.

55. What were the scores of Chen, David, and Eric respectively after Round 3?

- (a) 3, 0, 3 (b) 3, 3, 3  
(c) 3, 6, 3 (d) 3, 3, 0

56. Which three players were in the last three positions after Round 4?

- (a) Bala, Chen, Gordon (b) Bala, Ikea, Joshin  
(c) Hansa, Ikea, Joshin (d) Bala, Hansa, Ikea

57. Which player scored points in maximum number of rounds?  
 (a) Amita (b) Chen  
 (c) Joshin (d) Ikea
58. Which players scored points in the last round?  
 (a) Amita, Bala, Chen (b) Amita, Chen, David  
 (c) Amita, Chen, Eric (d) Amita, Eric, Joshin

**DIRECTIONS (Qs. 59-62) :** Go through the table and the information given below and answer the question that follows.

In the table below the check marks indicate all languages spoken by five people: Paula, Quentin, Robert, Sally and Terence. For example, Paula speaks only Chinese and English.

	Arabic	Basque	Chinese	Dutch	English	French
Paula			✓		✓	
Quentin				✓	✓	
Robert	✓					✓
Sally		✓			✓	
Terence			✓			✓

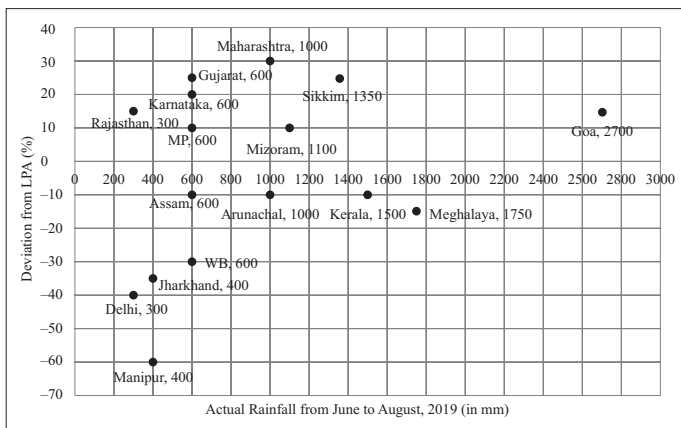
These five people form three teams. Team 1. Team 2 and Team 3. Each team has either 2 or 3 members. A team is said to speak a particular language if at least one of its members speak that language.

The following facts are known.

- (1) Each team speaks exactly four languages and has the same number of members.
  - (2) English and Chinese are spoken by all three teams. Basque and French by exactly two teams and the other languages by exactly one team.
  - (3) None of the teams include both Quentin and Robert.
  - (4) Paula and Sally are together in exactly two teams.
  - (5) Robert is in Team 1 and Quentin is in Team 3.
59. Who among the following four is not a member of Team 2?  
 (a) Quentin (b) Sally  
 (c) Terence (d) Paula
60. Who among the following four people is a part of exactly two teams?  
 (a) Paula (b) Robert  
 (c) Sally (d) Quentin
61. Who among the five people is a member of all teams?  
 (a) No one (b) Paula  
 (c) Terence (d) Sally
62. Apart from Chinese and English, which languages are spoken by Team 1?  
 (a) Arabic and Basque  
 (b) Basque and French  
 (c) Basque and Dutch  
 (d) Arabic and French

**DIRECTIONS (Qs. 63-66) :** Go through the figure and the information given below and answer the question that follows.

To compare the rainfall data, India Meteorological Department (IMD) calculated the Long Period Average (LPA) of rainfall during period June-August for each of the 16 states. The figure given below shows the actual rainfall (measured in mm) during June-August, 2019 and the percentage deviations from LPA of respective states in 2018. Each state along with its actual rainfall is presented in the figure.



63. If a 'Heavy Monsoon State' is defined as a state with actual rainfall from June-August, 2019 of 900 mm or more, then approximately what percentage of 'Heavy Monsoon States' have a negative deviation from respective LPAs in 2019?  
 (a) 42.86 (b) 57.14  
 (c) 75.00 (d) 14.29
64. If a 'Low Monsoon State' is defined as a state with actual rainfall from June-August, 2019 of 750 mm or less, then what is the median 'deviation from LPA' (as defined in the Y-axis of the figure) of 'Low Monsoon States'?  
 (a) 10% (b) -30%  
 (c) -10% (d) -20%
65. What is the average rainfall of all states that have actual rainfall of 600 mm or less in 2019 and have a negative deviation from LPA?  
 (a) 460 mm (b) 367 mm  
 (c) 500 mm (d) 450 mm
66. The LPA of a state for a year is defined as the average rainfall in the preceding 10 years considering the period of June-August. For example, LPA in 2018 is the average rainfall during 2009-2018 and LPA in 2019 is the average rainfall during 2010-2019. It is also observed that the actual rainfall in Gujarat in 2019 is 20% more than the rainfall in 2009. The LPA of Gujarat in 2019 is closest to  
 (a) 525 mm (b) 475 mm  
 (c) 505 mm (d) 490 mm



**SECTION : QUANTITATIVE ABILITY**

**DIRECTIONS (Qs. 67-100) :** Solve the following questions and mark the best possible option.

67. If  $(2n + 1) + (2n + 3) + (2n + 5) + \dots + (2n + 47) = 5280$ , then what is the value of  $1 + 2 + 3 + \dots + n$ ?
68. In 2010, a library contained a total of 11500 books in two categories - fiction and nonfiction. In 2015, the library contained a total of 12760 books in these two categories. During this period, there was 10% increase in the fiction category while there was 12% increase in the non-fiction category. How many fiction books were in the library in 2015?
69. Let  $ABC$  be a right-angled triangle with hypotenuse  $BC$  of length 20 cm. If  $AP$  is perpendicular on  $BC$ , then the maximum possible length of  $AP$ , in cm, is
70. The strength of a salt solution is  $p\%$  if 100 ml of the solution contains  $p$  grams of salt. Each of three vessels  $A$ ,  $B$ ,  $C$  contains 500 ml of salt solution of strengths 10%, 22%, and 32%, respectively. Now, 100 ml of the solution in vessel  $A$  is transferred to vessel  $B$ . Then, 100 ml of the solution in vessel  $B$  is transferred to vessel  $C$ . Finally, 100 ml of the solution in vessel  $C$  is transferred to vessel  $A$ . The strength, in percentage, of the resulting solution in vessel  $A$  is
71. The number of common terms in the two sequences: 15, 19, 23, 27, ..., 415 and 14, 19, 24, 29, ..., 464 is
72. Amal invests ₹ 12000 at 8% interest, compounded annually, and ₹ 10000 at 6% interest, compounded semi-annually, both investments being for one year. Bimal invests his money at 7.5% simple interest for one year. If Amal and Bimal get the same amount of interest, then the amount, in Rupees, invested by Bimal is
73. The real root of the equation  $2^{6x} + 2^{3x+2} - 21 = 0$  is
74. John jogs on track  $A$  at 6 kmph and Mary jogs on track  $B$  at 7.5 kmph. The total length of tracks  $A$  and  $B$  is 325 metres. While John makes 9 rounds of track  $A$ , Mary makes 5 rounds of track  $B$ . In how many seconds will Mary make one round of track  $A$ ?
75. What is the largest positive integer  $n$  such that  $\frac{n^2 + 7n + 12}{n^2 - n - 12}$  is also a positive integer?
76. Let  $A$  be a real number. Then the roots of the equation  $x^2 - 4x - \log_2 A = 0$  are real and distinct if and only if
77. In a triangle  $ABC$ , medians  $AD$  and  $BE$  are perpendicular to each other, and have lengths 12 cm and 9 cm, respectively. Then, the area of triangle  $ABC$ , in sq cm, is
78. In an examination, the score of  $A$  was 10% less than that of  $B$ , the score of  $B$  was 25% more than that of  $C$ , and the score of  $C$  was 20% less than that of  $D$ . If  $A$  scored 72, then the score of  $D$  was
79. How many pairs  $(m, n)$  of positive integers satisfy the equation  $m^2 + 105 = n^2$ ?
80. In a six-digit number, the sixth, that is, the rightmost, digit is the sum of the first three digits, the fifth digit is the sum of first two digits, the third digit is equal to the first digit, the second digit is twice the first digit and the fourth digit is the sum of fifth and sixth digits. Then, the largest possible value of the fourth digit is
81. Mukesh purchased 10 bicycles in 2017, all at the same price. He sold six of these at a profit of 25% and the remaining four at a loss of 25%. If he made a total profit of ₹ 2000, then his purchase price of a bicycle, in Rupees, was
82. In an examination, Rama's score was one-twelfth of the sum of the scores of Mohan and Anjali. After a review, the score of each of them increased by 6. The revised scores of Anjali, Mohan, and Rama were in the ratio 11:10:3. Then Anjali's score exceeded Rama's score by
83. Anil alone can do a job in 20 days while Sunil alone can do it in 40 days. Anil starts the job, and after 3 days, Sunil joins him. Again, after a few more days, Bimal joins them and they together finish the job. If Bimal has done 10% of the job, then in how many days was the job done?

84. A cyclist leaves  $A$  at 10 am and reaches  $B$  at 11 am. Starting from 10:01 am, every minute a motor cycle leaves  $A$  and moves towards  $B$ . Forty-five such motor cycles reach  $B$  by 11 am. All motor cycles have the same speed. If the cyclist had doubled his speed, how many motor cycles would have reached  $B$  by the time the cyclist reached  $B$ ?
- (a) 20 (b) 15  
(c) 23 (d) 22
85. If  $x$  is a real number, then  $\sqrt{\log_e \frac{4x-x^2}{3}}$  is a real number if and only if
- (a)  $1 \leq x \leq 2$  (b)  $-3 \leq x \leq 3$   
(c)  $1 \leq x \leq 3$  (d)  $-1 \leq x \leq 3$
86. If  $5^x - 3^y = 13438$  and  $5^{x-1} + 3^{y+1} = 9686$ , then  $x+y$  equals
87. Two ants  $A$  and  $B$  start from a point  $P$  on a circle at the same time, with  $A$  moving clock-wise and  $B$  moving anti-clockwise. They meet for the first time at 10:00 am when  $A$  has covered 60% of the track. If  $A$  returns to  $P$  at 10:12 am, then  $B$  returns to  $P$  at
- (a) 10:45 am (b) 10:25 am  
(c) 10:27 am (d) 10:18 am
88. The quadratic equation  $x^2 + bx + c = 0$  has two roots  $4a$  and  $3a$ , where  $a$  is an integer. Which of the following is a possible value of  $b^2 + c^2$ ?
- (a) 3721 (b) 361  
(c) 549 (d) 427
89. Let  $a, b, x, y$  be real numbers such that  $a^2 + b^2 = 25$ ,  $x^2 + y^2 = 169$ , and  $ax + by = 65$ . If  $k = ay - bx$ , then
- (a)  $k > \frac{5}{13}$  (b)  $k = 0$   
(c)  $0 < k \leq \frac{5}{13}$  (d)  $k = \frac{5}{13}$
90. Two circles, each of radius 4 cm, touch externally. Each of these two circles is touched externally by a third circle. If these three circles have a common tangent then the radius of the third circle, in cm, is
- (a)  $\sqrt{2}$  (b)  $\pi/3$   
(c)  $1/\sqrt{2}$  (d) 1
91. John gets ₹ 57 per hour of regular work and ₹ 114 per hour of overtime work. He works altogether 172 hours and his income from overtime hours is 15% of his income from regular hours. Then, for how many hours did he work overtime?
92. The average of 30 integers is 5. Among these 30 integers, there are exactly 20 which do not exceed 5. What is the highest possible value of the average of these 20 integers?
- (a) 4 (b) 5  
(c) 3.5 (d) 4.5
93. The salaries of Ramesh, Ganesh and Rajesh were in the ratio 6:5:7 in 2010, and in the ratio 3:4:3 in 2015. If Ramesh's salary increased by 25% during 2010-2015, then the percentage increase in Rajesh's salary during this period is closest to
- (a) 8 (b) 10  
(c) 7 (d) 9
94. How many factors of  $2^4 \times 3^5 \times 10^4$  are perfect squares which are greater than 1?
95. Let  $a_1, a_2, \dots$  be integers such that  $a_1 - a_2 + a_3 - a_4 + \dots + (-1)^{n-1} a_n = n$ , for all  $n \geq 1$ . Then  $a_{51} + a_{52} + \dots + a_{1023}$  equals
- (a) 1 (b) 10  
(c) 0 (d) -1
96. The base of a regular pyramid is a square and each of the other four sides is an equilateral triangle, length of each side being 20 cm. The vertical height of the pyramid, in cm, is
- (a)  $10\sqrt{2}$  (b)  $5\sqrt{5}$   
(c)  $8\sqrt{3}$  (d) 12
97. A man makes complete use of 405 cc of iron, 783 cc of aluminium, and 351 cc of copper to make a number of solid right circular cylinders of each type of metal. These cylinders have the same volume and each of these has radius 3 cm. If the total number of cylinders is to be kept at a minimum, then the total surface area of all these cylinders, in sq cm, is
- (a)  $8464\pi$  (b)  $928\pi$   
(c)  $1026(1 - \pi)$  (d)  $1044(4 + \pi)$
98. A shopkeeper sells two tables, each procured at cost price  $p$ , to Amal and Asim at a profit of 20% and at a loss of 20%, respectively. Amal sells his table to Bimal at a profit of 30%, while Asim sells his table to Barun at a loss of 30%. If the amounts paid by Bimal and Barun are  $x$  and  $y$ , respectively, then  $(x - y)/p$  equals
- (a) 1.2 (b) 1  
(c) 0.7 (d) 0.50
99. Let  $f$  be a function such that  $f(mn) = f(m)f(n)$  for every positive integers  $m$  and  $n$ . If  $f(1), f(2)$  and  $f(3)$  are positive integers,  $f(1) < f(2)$ , and  $f(24) = 54$ , then  $f(18)$  equals
100. Let  $A$  and  $B$  be two regular polygons having  $a$  and  $b$  sides, respectively. If  $b = 2a$  and each interior angle of  $B$  is  $3/2$  times each interior angle of  $A$ , then each interior angle, in degrees, of a regular polygon with  $a + b$  sides is

# Hints & Explanations

1. (b) In order to attempt this question successfully, you need to understand the meaning of the sentence and words used in it. The word endogenous must be understood in its right context. The phrase endogenous change means change from within. The meaning of the sentence is that the transformation in society resulted out of external forces rather due to internal changes. Option (b) is the right answer because it claims that transformation of Indian society was not internal or organic (organic is something taking place naturally. Internal change is organic) but was forced by colonial agendas or external forces.
2. (d) This question can be easily attempted without referring back to the passage. You only need to understand the meaning of the sentence given in question. When we say something is marginalized it means, it is made insignificant or relegated to the margins. According to the sentence, the colonial state was marginalized. It means the colonial state was relegated to the periphery of the Indian society. In this case the colonial state is the small ruling elite which was marginalized because it was a small group. In order to come out of the marginalization, it tried to introduce modernity in the Indian society. Modernization effort in effect was an attempt at mainstreaming the Indian society. If colonial India was modernized then the colonial state would be a part of the mainstream Indian society. If we look at the options in the background of the above explanation, it will be clear that option (d) is the right choice.
3. (a) According to the question, all of the options give support the arguments in the passage, but there is one option that does not support the arguments. You can easily identify the arguments made by the author in the passage. The points given in the options may either not be mentioned in the passage or may be opposite of the points made by the author. In both the cases, they can be said to be not supporting the arguments.  
You may easily note that (b), (c) and (d) options support the arguments. Option d is "the introduction of capitalism in India was not through the transformation of feudalism, as happened in Europe." This supports the argument because the author mentions in the second paragraph that historians have argued that capitalism in India was introduced without any modification.  
Option (c) "the introduction of capitalism in India was not through the transformation of feudalism, as happened in Europe" also supports the argument because it has been mentioned in the passage. In paragraph 1, the author says, "as some empirically

inclined theorists of that generation considered the colonies a massive laboratory of utilitarian or other theoretical experiments". This can lead us to conclude that option (c) supports the argument made by the author. Option (b) is also mentioned in the passage. Option (b) has come towards the end of the passage, in the last para. If you read the last para carefully, you might come across the statement which means since modernity was externally imposed, it led to development of underdevelopment.

Option (a) does not support the argument. Towards the end of the first paragraph you will find the following sentences: "But this modernity did not enter a passive society. Sometimes, its initiatives were resisted by pre-existing structural forms. At times, there was a more direct form of collective resistance." From this, you can conclude that modernity in Indian society was not induced by resistance. The passage further says that "the map of continuity and discontinuity that this state left behind at the time of independence was rather complex and has to be traced with care." Therefore option (a) is the correct answer.

4. (b) Read the first paragraph carefully. Now read the given options. It will be clear to you that all the options except option (b) can be inferred from the first paragraph. Treatment of colonies as experimental sites is mentioned in the first paragraph, which is option (a). Similarly, enlightenment rationalism as the motivation behind the change in colonial policy is also mentioned in the first paragraph. This is option (d).

The sentence in the first paragraph, "It had restructured everything in Europe—the productive system, the political regimes, the moral and cognitive orders—and would do the same in India," appears to support option (c). From the above, it is not difficult to see that options (a), (c), and (d) are supported or can be inferred about the British colonialism.

Now we are left with option (b). It is "it faced resistance from existing structural forms of Indian modernity." You may think this is also given in the passage or can be inferred. However, there is a catch, the exact sentence in the passage is "Sometimes, its initiatives were resisted by pre-existing structural forms." So the point to note is that the resistance was not from existing structural forms of Indian modernity as given in the option, rather resistance was from the pre-existing structural forms or the traditional structural forms as given in the passage. Therefore, option (b) cannot be inferred and hence it is the correct answer.

5. (d) If you note carefully some of the logical sequence will be evident while some others may have to be referred back to be found out. Colonial policy is the first stage as is natural or logical. This will be followed by enlightenment (the British colonial state represented the great conquering discourse of Enlightenment rationalism,) and underdevelopment will be the last in the sequence as can be found out from the last sentence of the passage. There is only one option with underdevelopment as the last stage of the sequence. This is option (d) which is the right answer.

6. (c) This question can be answered by using common sense and by having the understanding of the claims made by Google and CyArk.

Option (a) is that company provides images free of cost to all users. The companies are most likely to use this argument as Google and CyArk have done. Similarly the second option is also the claim that may be made by a company.

However, the argument put forth in choice (c) is least likely to be made by a company and Google/CyArk have also not advanced this argument. However, option (d) is a claim that any company might use include Google/CyArk.

Therefore, option (c) is the right choice.

7. (d) You need to know Dr Watrall's view to answer this question. To understand his views read the following part of the passage: "Ethan Watrall, an archaeologist, professor at Michigan State University and a member of the Society for American Archaeology, says he's not comfortable with the arrangement between CyArk and Google. . . . Watrall says this project is just a way for Google to promote Google. "They want to make this material accessible so people will browse it and be filled with wonder by it," he says. "But at its core, it's all about advertisements and driving traffic." Watrall says these images belong on the site of a museum or educational institution, where there is serious scholarship and a very different mission."

From the above view, it is clear that Dr. Watrall is not dismissive of laypeople's access to specialist images of archaeological and cultural sites. This is option (a), which is rejected. Option (b) is also rejected because he is not against the technology but against Google's intentions. We have to choose between option (c) and (d). Option (c) does not appear to be the right choice because Google and CyArk are not making the commercial use of images but uses the images to drive traffic by giving people free access to images. Getting traffic may result in revenues but it is not a commercial use.

Therefore, option (d) is the most appropriate choice.

8. (a) If we can understand the meaning of the phrase digital colonialism, there would be no need to refer back to the passage while answering. Colonization is a term

we are familiar with. It means, a country or an agency that usurps the rights of another country or people. The colony has access to the resources of the colonized. So we can guess that the critics of CyArk are referring to the fact that Google and CyArk have the copy right to the images of the archaeological objects while the country that owns these objects have no rights over them. This becomes more clear, when you refer back to the passage. The relevant sentence is: "CyArk owns the copyrights of the scans — not the countries where these sites are located. That means the countries need CyArk's permission to use these images for commercial purposes." This is what critics call digital colonization. So the correct answer is option (a).

9. (b) Read the following sentences from the last paragraph to answer this question. The last paragraph sentences are: "Erin Thompson, a professor of art crime at John Jay College of Criminal Justice in New York City, says it's the latest example of a Western nation appropriating a foreign culture, a centuries-long battle".

This means it is not the illegal downloading of content from the internet as stated in option (a). So this option is rejected. However, this is very close to option (b), which is the seizing of ancient Egyptian artefacts by a Western museum. The claim made by John Jay is "it's the latest example of a Western nation appropriating a foreign culture, a centuries long battle". Seizing of the Egyptian artefacts by a western nation includes (a) a western nation appropriating a foreign culture and (b) a centuries long battle because Egyptian mummies were taken away by the western museum nearly a century ago. So this option is the right choice. The other options are far fetched.

10. (a) You have to keep the arguments of Dr Watrall in to answer this question. Then identify which of the options will negate his argument. Watrall's argument in the passage can be stated as follows: "Watrall says these images belong on the site of a museum or educational institution, where there is serious scholarship and a very different mission".

Now the first option punctures Dr Watrall's argument. If CyArk uploads its scanned images of archaeological sites onto museum websites already, there would be no need for Dr Watrall to argue that these images belong on the site of a museum.

The other arguments will make Dr. Watrall's argument meaningless rather than invalidate his argument. For instance, if there is a ban on CyArk scanning archaeological sites in other countries, he has nothing to argue against CyArk. So option (b) is rejected. Similarly, we can figure out the discrepancies in other options.

Therefore, option (a) is the right answer.



11. (b) Let us understand the question. In the passage, the author talks about the greenness of cities. The question wants you to identify the option that would counter the argument in favor of greenness of the cities.

Given the choices provided, the question is easy. You may not have to read the passage to answer the question because common sense answer would be more effective here. Option (a) is about compactness of big cities and the incidence of violent crime. This has nothing to do with the greenness of cities. So we can reject this option. Option (b) is meaningful from the perspective of the question. It says that the high density of the cities leads to the increase of CO<sub>2</sub> and greenhouse gases. This argument undermines the logic on the greenness of the cities. This could be our possible answer, but let us see other options as well.

Option (c) is about the increasing cost of utilities. This has nothing to do with the greenness of the cities. So we can reject this option.

Option (d) is about rubbish leading to spread of diseases in slums. This has nothing to do with the greenness of the cities.

Therefore, the correct answer is option (b).

12. (d) If you read the question and the options, you will get a feeling that all the options are correct because we have to find one option that is not the reason for squatter cities as being environment friendly. Therefore, even if all the options are correct you should choose the option that has the least weight as a reason for making squatter cities environment friendly.

It is true that cities recycle material as given in the passage, but we will reject this option because it is an 'except' question, that is, the option should not be a reason for city being environment friendly. Option (b) can be eliminated for the same reason.

Next, we have to choose one of the two options left. Option (c) is they sort out garbage and option (d) is their streets are kept clean. Between the two options, we have to select the one that will have less impact on environment than the other. Sorting out garbage will have more impact on the environment friendliness than keeping the roads clean. Also, the passage discusses sorting the garbage. Therefore, eliminate option (c) and keep the option (d). So option (d) is the right option as the answer.

13. (d) Read Calthorpe's statement to answer this question. The reference in the passage is as follows: "In his 1985 article, Calthorpe made a statement that still jars with most people: "The city is the most environmentally benign form of human settlement. Each city dweller consumes less land, less energy, less water, and produces less pollution than his counterpart in settlements of lower densities."

The question is why most people see the above statement as jarring or unlikely to be accepted. All of the given

choices seems correct. However, the option that is direct opposed to the statement of Calthorpe would be correct. Although it may be true that most people do not regard cities as good places to live in, but it is a very wide statement. We have to look for an option that denies cities as environment friendly or eco-friendly. So this option can be rejected.

The second option is also not exactly relevant as it is about cities being very crowded and polluted. Calthorpe recognizes that cities are crowded or denser hence they consume fewer resources and produce less pollution. We can reject this statement or option.

The third option is about cities being places of disease and crime. This option does not invalidate Calthorpe's statement. So we can reject this.

However option (d) appears to be correct because when Calthorpe claims cities as the most environmentally benign form of human settlement. He claims that cities cause less pollution but people would find this statement jarring because they would find cities causing pollution. This is what option (d) says exactly. So our answer is (d) that is people "do not consider cities to be eco-friendly places"

14. (b) The question presumes that the passage discusses cities as good places to live in. Your task is to find out the reasons author of the passage cites as advantageous and identify which among the reasons given in options has not been mentioned in the passage. This may require you to read the entire passage quickly and underline points that are in favor of cities as a good place to live in. You will find your answer in the second half of the passage from paragraph 3.

Option (a) (help prevent destruction of the environment) has been discussed extensively. For instance, the entire third paragraph beginning from "In his 1985 article...." is about environment and how cities help prevent destruction of environment. Similarly, there are references to jobs or employment opportunities. Read the second last paragraph: "[T]he nationally subsidised city of Manaus in northern Brazil "answers the question" of how to stop deforestation: give people decent jobs." There is no direct reference to cultural transformation but it can be inferred from the passage from the following sentences: "They concentrate crime, pollution, disease and injustice as much as business, innovation, education and entertainment" (Last paragraph) and "They are transformative: in the slums, as well as the office towers and leafy suburbs," (Last sentence of the last paragraph). However, option (b) is nowhere mentioned in the passage. So, this is our answer.

15. (c) This question should not be difficult to answer, if you have read the passage. In the passage, the city of Manaus is discussed as an example to show how cities are environmentally beneficial along with the creation of jobs.

Regarding Manaus, the author claims: [T]he nationally subsidised city of Manaus in northern Brazil “answers the question” of how to stop deforestation: give people decent jobs. Then they can afford houses, and gain security. One hundred thousand people who would otherwise be deforesting the jungle around Manaus are now prospering in town making such things as mobile phones and televisions. . . .

Now look at the options. Option (a) is incorrect because the passage does not talk about the source of labour in the cities. Option (b) is about cities as employment hubs. Cities are employment hubs but author discusses environment or how to stop deforestation which results in employment. Therefore, this option has to be rejected. Option (c) appears exact and appropriate. The author discusses it in order to explain how urban areas help the environment. In the passage there is a sentence that gives us a clue. It is “[T]he nationally subsidised city of Manaus in northern Brazil “answers the question” of how to stop deforestation: give people decent jobs.” Here how to stop deforestation is prior to giving people the decent jobs. Therefore, this option is the right option. The fourth option is irrelevant. Therefore, option (c) is the right choice.

16. (c) This question can be easily answered if you have grasped the sense of the passage. You may not find it directly anywhere in the passage but you have to grasp the key ideas of the author. The option (a) would be incorrect because the author would never discourage an ethnographer from learning a new language or studying a new culture. Option (b) would also be incorrect because the author has learned the language directly by experiencing the culture. So the author would most likely not recommend a translator.

Option (c) is the right choice because the author would encourage the ethnographer to learn the language as he himself learned the language.

Option (d) would be incorrect because author is unmindful of racial and gender identities. In fact, he tries to prove that the word Oriental would not apply to him. Therefore, Option (c) is our right choice.

17. (c) Read the following sentence from the third last paragraph from the passage to answer this question: “My identity as a white male was far less important than my ability to communicate.” This is close to option (b). Which shows language has the ability to mediate the impact of identity makers one is born with, that is, language can change us. Option (a)- Language’s intrinsic connection to our notions of self and identity is able to change us. People consider you more favorably when you speak their language. You are welcomed because you speak a particular language shows the language has intrinsic connection with your identity. People welcome you

because they identify with you and find you similar to them.

While option (d) is mentioned in the passage, we do not find option (c). Option (d) is about the ups and downs involved in course of learning a language. It is mentioned in the passage in the following words: “This learning process—the embarrassments, the frustrations, the gradual sense of understanding and connection—is invariably transformative.” Therefore, we are left with option (c), which is the right answer.

18. (b) “Which way is oriental?” occurs in the second last paragraph. When you read the entire paragraph and the entire passage, you will understand the context in which this question is raised. Here is the paragraph: *And that easily lobbed word—“Orientalist”—hardly captures the complexity of our interactions. What exactly is the dynamic when a man from Missouri observes a Zhejiang native selling lingerie to an Upper Egyptian woman? . . . If all of us now stand beside the same river, speaking in ways we all understand, who’s looking east and who’s looking west? Which way is Oriental?*

The word Oriental means western. The readers are objecting to an Oriental writer writing on the Chinese women using the Middle East language. The author responds that it is not the question of Oriental as we share the same identity. According to the author we share the same cultural space, speak the same language and understand each other. Thus language breaks the barrier of cultural identity according to the author.

Option (b) also claims the same thing. It says learning another language can mitigate cultural hierarchies and barriers. None of the other options are correct because neither goodwill nor globalization relate to what the author claims. Therefore, option (b) is correct.

19. (c) If you can understand the authors view point, you can guess the view point of the critic. You may not find the answer directly in the passage. The key point that author seems to be making is that language can overcome cultural barriers and the barriers of identity that we are born with. Author’s critics would make a view opposed to this.

Option (a) linguistics politics can be erased is something that author also claims directly or indirectly. So this option is incorrect.

Option (b) is empathy can overcome identity politics is the point of view of the author because author claims that learning the language of other culture makes the others empathetic to you.

Option (c) is the claim opposed to the author’s point of view because author claims that language is sufficient to bridge cultural gaps. So option (c) is the correct choice. Option (d) is a deviation from the main topic. Author does not claim or disclaim orientalism can or cannot be practiced by the Egyptians. So we have to reject this option.

20. (d) The aim of this question is to test whether you understand the meaning of “long pedigree”. This phrase in simple terms means long history. So you can reframe the question as: What do you mean by the long pedigree of the aim to shift civil servants to improve their living standards? Its meaning is best brought out by option (d): “it is not a new idea and has been tried in the past”. So option (d) is the correct choice.
21. (a) Read the following in the last paragraph of the passage: “The dilemma is obvious. Pick small, poor towns, and areas of high unemployment get new jobs, but it is hard to attract the most qualified workers; opt for larger cities with infrastructure and better-qualified residents, and the country’s most deprived areas see little benefit. . . .” The dilemma is clear and obvious.  
Now let us see the options. Options (a) and (b) are almost similar and close to the sense brought out in the passage. Option (c) is clearly not correct. It speaks about boosting employment in larger cities which is not discussed in the passage. Similarly, option (d) talks about relocation of private enterprises and hence it can be rejected.  
Between option (a) and (b), option (a) is better because it speaks about boosting growth in smaller areas while this is missing in option (b). Therefore, option (a) is the correct choice.
22. (d) In the given question certain reasons that support decentralization of central government functions are given. These are the reasons that people make for decentralization. Your task is to identify the least likely reason that people give or the least likely reason. So the options that support decentralization can be rejected.  
Option (a) supports decentralization as discussed in the passage. The author extensively discusses the cost factor. Therefore, this option is rejected.  
Options (b) and (c) are also rejected. If you read the second paragraph carefully, you will find these arguments. Fresh thinking or new ideas and autonomy in regulations have been extensively discussed in the passage.  
We do not find option (d) discussed anywhere in the passage. Therefore, it is the right option.
23. (b) The answer may be found in the first paragraph. The question is “colonial powers located their capitals” while the passage mostly talks about relocation of bureaucrats in the post-colonial era. The first sentence of the first paragraph reads as follows: “Around the world, capital cities are disgorging bureaucrats. In the post-colonial fervour of the 20th century, coastal capitals picked by trade-focused empires were spurned for “regionally neutral” new ones .” Read the second sentence above: It is “In the post-colonial fervour of the 20th century, coastal capitals picked by trade-focused empires were spurned”. It means coastal capitals picked by trade focused empires were spurned in the post-colonial era.  
Trade focused empires were the colonial empires with largely trade interests. In other words, the colonial powers located their capitals to promote their trading interests. This is the second option. Therefore option (b) is correct.
24. (d) If you read the passage even once, you will note that pollution levels and congestions have not been mentioned even once in the passage. In fact, when government agencies relocate to a new place from the capital city, it is usually a smaller place which is not as polluted and congested as the big cities like the capital cities. So option (d) is the obvious choice because it is not a reason that explains why relocating government agencies have not been a success. Therefore, option 4 is the right choice.
25. (c, d, b, a)  
When you read the four sentences, you can easily make out the first sentence by examining each of them. When you read the first sentence “Such a belief in harmony...” you can infer something comes before it that stands for “such a belief”. The next sentence begins with “these parts” and you can sense something should come before for which “these parts” stand. Similarly the fourth sentence begins with “it is an example”, so we can guess something must come before for which ‘it is an example’ works as a reference. The third sentence stands alone without the need of a prior sentence to make sense of it. So the first number is (c).  
Sentence (d) follows next because we can infer “the notion of a balance of nature” is an example of an ancient belief system....So the sentence to follow (c) is (d).  
Sentence (d) ends with “component parts” and sentence (b) begins with “these parts”. So these two sentences are together with (b) following the (d). Finally we are left with (a) which naturally follows (b). Therefore, the right sequence is (c, d, b, a).
26. (d, a, c, b)  
Read all the options or sentences. The first sentence is sentence (d) because this sentence is in the nature of introduction or simple definition of clock time which has been discussed at a more complex level in the other options.  
Sentence (d) talks of the representation of clock-time. The next sentence where there is reference of this representation with the use of the word representation is sentence (a). So the sequence we get is (d, a).  
The next sentence will be sentence (c). Let us see how. Sentence (a) talks of deleterious effect which is harmful effect. The theme of negative or deleterious effect is further extended in sentence number (c) “it is found that caring time is often more focused on the clock than generally theorised”  
We are now left with sentence number (b), which is a form of conclusion to the introduction of an article as evident from “this article argues....” in the sentence number (b). So the right sequence is (d, a, c, b).



27. (a) If you read the options, you will realize all of them are correct but we have to choose the best among them, and the best among them is the one that puts across the idea succinctly without missing out on original elements in the passage.

Let us begin with the option (a). This is correct and it carries the idea of intention of the inventors of wall free office spaces and the reason why they did not work out. Option (b) is also correct but instead of directly stating the reason why wall free offices did not work, it has been stated indirectly that companies did not care for worker's satisfaction. The reason in the passage is "But companies took up their idea less out of a democratic ideology than a desire to pack in as many workers as they could." Even though this answer is correct the first option is preferable.

Option (c) is correct but it does not explain the reason why wall free office did not work as has been done in the option (a). So option (c) is also rejected.

Option (d) is also correct but to say that the companies did not believe in democratic ideology would be incorrect where as the fact is the companies took up their ideas less out of a democratic ideology than a desire to pack as many workers as they could. There is a difference between companies not believing in democratic ideology and less out of democratic ideology. So this option is also rejected. Therefore, option (a) is the best choice.

28. (b) In this question you have to read the passage and then decide which is the best one sentence summary of the passage out of the given options. After you read the passage and the options, you will find all the options nearly summarize the passage. So you can try to find the options in which one or more crucial elements may be missing or something new may have been added.

Option (a) is correct because an autapomorphy is a distinctive feature, known as a derived trait. However, we will have to see, if there is some more options with improvements over this one. Option is more specific, accurate and captures all essential information. Option (c) is also correct but it fails to capture the essence such as evolved, features of cognitive process such as memory. Option (d) is also correct but it does not capture the essence of the paragraph. It merely mentions one characteristic or fact.

29. (b) If you read the sentences, you will realize they all talk about plastic or ocean plastic. So we will find out which sentences should go together. Sentence number (e) "Eating plastic has a number of negative consequences...." is related to sentence number (c) "Aside from clogging up the digestive tract..." Both these sentences talk about the negative aspects of plastic and the consequences for marine animals who eat plastic. Sentence number (a) also talks about the problems with ocean plastic because

marine animals eat it. So sentence number (a),(e) and (c) are in sequence. Now we have to choose between (d) and (b). Sentence number (d) is a better choice because it talks about plastic in ocean as an environmental problem. So the sequence is (d, a, e, c), while (b) is the odd man out.

30. (d) While all the four options go on to say something or the other as summary of the passage, most of them are not balanced and take merely one side or factor into account. The summary is one that succinctly captures the essence of the passage. The passage concludes that it is easy to mobilize people into a movement from hybrid organizations in comparison to the non-hybrid organizations.

Option (a) is correct. In the passage too the following statement is there: "Studies of the post-9/11 U.S. antiwar movement show that individuals with past involvement in non-anti-war movements are more likely to join hybrid organizations" So we will retain this option for now.

Option (b) is also correct as can be seen in the very first sentence of the passage: "Social movement organizations often struggle to mobilize supporters from allied movements in their efforts to achieve critical mass".

Option (c) is also correct as can be seen from the following sentence in the passage: "In addition, they show that organizations with hybrid identities occupy relatively more central positions in inter-organizational contact networks within the antiwar movement and thus recruit significantly more participants".

Similarly option (d) is also correct. However, we have to identify the best one among them. The best option will be the most general response because it has to capture the essence of the passage and that is not based on one example here and there.

Option (a) is rejected because it is a specific 9/11 statement rather than a generalized statement. Option (b) is rejected because it is a statement taken from a passage rather than the summary.

Option (c) also suffers from the same deficiency, that is, it is a statement randomly taken from the passage.

However, option (d) is the summary and the right choice because it is the conclusion of the passage and represents the broad essence of the passage. So this is the correct choice.

31. (a) In this question, you only need to find out the sentence that does not fit with the rest of the sentences which are related in some way. As a first step read all the sentences without caring for their order so as to find a common theme. You will find that the idea of 'rumination' has been introduced. (c) and (d) sentences have the word 'rumination' in them. So they are related. Sentence (e) begins with 'the idea is that...'. There is a suggestion of alternative idea as opposed to rumination because



rumination can be harmful. The alternative idea is suggested by the word 'illeism'. Therefore we can see the direct link between (e) and (b). Therefore, (d, c, b, e) are related and make a coherent paragraph while option (a) is left out which is the answer.

32. (b, d, c, a)

When you read the 4 sentences randomly, you cannot make a head or tail out of it. All the sentences appear independent and unrelated. It is difficult to find the first sentence, but if you try to make sense of the sentences, you will realize that the author is trying to answer questions about structure, category and adaptive behaviour. Next, he takes each of these concepts once by one. So the first sentence begins by explaining or defining what is adaptive behaviour. Then the next sentence is about category. This is followed by the structure and order. The sentence adaptive behaviour comes first because it contains the word object. The next sentence explains the object. The third sentence informs us about structure (each object has structure). The last sentence is like a conclusion or general statement that says about correlational structure. So the sequence is (b, d, c, a).

33. (b) You have to find out the sentence that does not go with the rest. So, read all the options randomly one by one. As you read the sentences, you realize all of them have the common theme of single-panel, humor, cartoon etc. Let us try to sequence the sentences. The first sentence is either the first number or the second number sentence because it answers the question what makes the single panel comic so engaging in one complete sentence. Sentence number one gives us an interesting example of inference. For now we will keep both of them. The next sentence is (e) which explain further what is single panel (a series of panels out of which cartoonist chose one). Sentence number (d) talks about having to figure out the missing panels to get the joke. This has to do with inference, so we can keep the sentence number (a). Sentence number (c) is about you having to figure out what happened before and after the panel that was shown to you. Therefore, you have to infer something. So this is another reason to keep sentence number (a). Therefore, (a, c, d, e) forms a coherent paragraph while (b) is the odd man out.

34. (b, a, d, c)

You can decide which sentence should come first by taking note of the word that a sentence begins with. The first sentence of a meaningful paragraph should not generally start with words like "To", "After", and "However". So the first sentence should be number (b) statement. In addition, the beginning sentence must define a concept if the concept has been used in the para. The next sentence should give out the meaning or definition further or give an example. Therefore, it

will be followed by number (a). Next, a contrary idea or condition should explicate it further, which is explicated by number (d). Finally, the number (c) is left out which will come in the end and its correct position may be confirmed by its nature as a conclusive statement. The right sequence that we get is (b, a, d, c).

**Sol. (35-38):** Suppose that the total revenue in three years 2016, 2017 and 2018 are A, B and C and total cost are in that years X, Y and Z. The information given can be tabulated as below.

**Cost :**

Year	Clothing	Produce	Electronics
2016	0.3X	0.4X	0.3X
2017	0.3Y	0.3Y	0.4Y
2018	0.2Z	0.5Z	0.3Z

**Revenue :**

Year	Clothing	Produce	Electronics
2016	0.2A	0.3A	0.5A
2017	0.3B	0.4B	0.3B
2018	0.4C	0.4C	0.2C

Now, from information (1)

Percentage profit in 2016 100 %

$$\therefore \left( \frac{A - X}{X} \right) \times 100 = 100$$

$$A = X + X \Rightarrow A = 2X \quad \dots(i)$$

From information (2), store revenue doubled from 2016 to 2017

$$\therefore B = 2A \quad \dots(ii)$$

and cost double from 2016 to 2018  $\Rightarrow 0.3Z = 2 \times 0.3X$

$$\Rightarrow Z = 2X \quad \dots(iii)$$

From condition (3), No profit from electronics department in 2017.

$\therefore$  Revenue from electronics in 2017

= Cost from electronics in 2017

$$0.3B = 0.4Y \Rightarrow B = \frac{4}{3}Y \quad \dots(iv)$$

From condition (4),

In 2018, Revenue from the clothing department

= Cost from produce department

$$\Rightarrow 0.4C = 0.5Z \Rightarrow C = \frac{5}{4}Z \quad \dots(v)$$

35. (25%)

Percentage profit in 2018

$$= \frac{(\text{Total revenue} - \text{Total cost})}{\text{Total cost}} \times 100$$

$$= \frac{C - Z}{Z} \times 100 = \frac{\frac{5Z}{4} - Z}{Z} \times 100$$

$$= \left( \frac{5 - 4}{4} \right) \times 100 = 25\%$$

36. (c)

Ratio

$$= \frac{\text{Revenue generated from produce department in 2017}}{\text{Revenue generated from produce department in 2018}}$$

$$= \frac{0.4B}{0.4C} = \frac{B}{C} = \frac{2A}{C} = \frac{2(2X)}{\frac{5}{4}(Z)} = \frac{16X}{5Z}$$

$$= \frac{16X}{10X} = \frac{8}{5}$$

37. (70%)

Total profit in 2016 = Revenue in 2016 – Cost in 2016

$$= A - X$$

from (i),  $A = 2X$ 

$$\therefore \text{Profit} = A - X = 2X - X = X$$

Profit from electronics department in 2016

$$= 0.5A - 0.3X = 0.5(2X) - 0.3X = 0.7X$$

$$\text{Now, required percent} = \frac{0.7X}{X} \times 100 = 70\%$$

38. (c)

Profit percent in 2017

$$= \left( \frac{B - Y}{Y} \right) \times 100 = \left( \frac{\frac{4}{3}Y - Y}{Y} \right) \times 100$$

$$= \frac{100}{3} \% = 33.33\%$$

Profit percent in 2018

$$= \left( \frac{C - Z}{Z} \right) \times 100 = \left( \frac{\frac{5}{4}Z - Z}{Z} \right) \times 100 = 25\%$$

Difference in profit percentage =  $33.33\% - 25\% = 8.33\%$ **Sol. (39-42):** From given data,Let number of questions worth 5 marks, 10 marks and 15 marks was  $x$ ,  $y$  and  $z$  respectively, then,  $4 \leq x$ ,  $3 \leq y$  and  $2 \leq z$ **Case-I :** Total possible combination that gives 100 marks

Minimum total marks that are from 10 marks question

$$= 3 \times 10 = 30 \text{ marks}$$

Minimum total marks that are from 15 marks questions

$$= 2 \times 15 = 30 \text{ marks}$$

Maximum total marks that are from 5 marks questions

$$= 5 \times 8 = 40 \text{ marks}$$

$$\therefore 4 \leq x \leq 8$$

**Case-II :** When  $x$  and  $z$  are minimum

Minimum number of 5 marks questions = 4

$$\text{Total marks} = 5 \times 4 = 20 \text{ marks}$$

Minimum number of 15 marks questions = 2

$$\text{total marks} = 2 \times 15 = 30$$

Maximum number of 10 marks questions

$$= \frac{100 - (20 + 30)}{10} = 5$$

So,  $3 \leq y \leq 5$ .**Case-III :** When  $x$  and  $y$  are minimum

Minimum number of 5 marks questions = 4

$$\text{total marks} = 5 \times 4 = 20 \text{ marks}$$

Minimum number of 10 marks questions = 3

$$\text{total marks} = 3 \times 10 = 30 \text{ marks.}$$

Maximum number of 15 marks questions

$$= \frac{100 - (20 + 30)}{15} = 3.33$$

$$\therefore 2 \leq z \leq 3$$

Now, tabulating the values, we have

Number of questions	Marks for each questions	total marks
$4 \leq x \leq 8$	5	(20, 40)
$3 \leq y \leq 5$	10	(30, 50)
$2 \leq z \leq 3$	15	(30, 45)

Again from question, number of questions in ET is more than MT. So, ET has maximum 5 marks questions than MT

For ET :  $x = 8$ ,  $y = 3$  and  $z = 2$ 

$$\Rightarrow \text{Total marks} = 8 \times 5 + 3 \times 10 + 2 \times 15 = 100$$

$$\text{Total number of questions} = 8 + 3 + 2 = 13$$

For MT (i)  $x = 5$ ,  $y = 3$  and  $z = 3$ 

$$\Rightarrow \text{Total marks} = 5 \times 5 + 3 \times 10 + 3 \times 15 = 100$$

$$\text{Total number of questions} = 5 + 3 + 3 = 11$$

(ii)  $x = 4$ ,  $y = 5$  and  $z = 2$ 

$$\text{Total marks} = 4 \times 5 + 5 \times 10 + 2 \times 15 = 100$$

$$\text{total number of questions} = 4 + 5 + 2 = 11$$

Now, considering MT and ET together, each faculty member prepared the same number of questions total number of questions =  $13 + 11 = 24$ 

So, number of questions prepared by each faculty

$$= \frac{24}{6} = 4 \text{ questions}$$

Here, Annie prepared only one question for MT, So, rest 10 questions of MT is prepared by other 5 faculty such that 2 questions are prepared by each.

Again, each faculty, prepare 4 questions.

So, each faculty except Annie prepared 2 questions for ET and Annie prepared three questions for ET.

Here each members prepared, questions continuously. Based on that, we get the following table:

Order of questions prepared by the faculty

Q. No.	Question prepared for ET	Marks
1	Dave	5
2	Dave	5
3	Chetan	5
4	Chetan	5
5	Annie	5
6	Annie	5
7	Annie	5
8	Esha	5

9	Esha	10
10	Beti	10
11	Beti	10
12	Fakir	15
13	Fakir	15

Q. No.	Question prepared for MT	Marks
1	Fakir	5
2	Fakir	5
3	Chetan	5
4	Chetan	5
5	Annie	5
6	Beti	10
7	Beti	10
8	Esha	10
9	Esha	15
10	Dave	15
11	Dave	15

39. (d)

Second question in ET was prepared by Dave.

40. (c)

As Annie prepared 5<sup>th</sup> question of 5 marks for MT then, number of 5 marks questions for MT = 5 and, number of 5 marks question for ET = 8  
Total number of 5 marks questions = 5 + 8 = 13

41. (a) 15 marks questions for both ET and MT prepared by only Dave, Esha and Fakir

42. (d) 10<sup>th</sup> question of 10 marks prepared by Beti for ET

Sol. (43-46):

As per question it is not clear that a student can not prefer both Ragini and Sunita simultaneously

From point 1, 250 students supported proposal A and 250 students supported proposal B

From point 2, it is clear that 200 students preferred Sunita so number of students who preferred Ragini = 500 – 200 = 300

Number of students who preferred Sunita and supported proposal A = 80% of 200 = 160

From point 3, Number of students who preferred Ragini and supported proposal A = 30% of 300 = 90

From point 4, Number of students who preferred Sunita and supported proposal B = 20% of 250 = 50

From point 6, Number of students who preferred Sunita and supported proposal A and B both = 50

From point 7, Number of students who preferred Ragini and didn't supported any proposal = 20% of 300 = 60

Now the complete table can be formed as given below :

	Sunita	Ragini	Total
A	160	90	250
B	50	200	250
Both A and B	50	50	100
		[(A + B + None of A and B) – Total]	
None of A and B	40	60	100
	[Total (A + B – Both A and B)]		
Total	200	300	500

43. (64)

Percentage of students who preferred Sunita for student union president out of the student surveyed who supported proposal A

$$\frac{160}{250} \times 100 = 64\%$$

44. (84)

Number of the students surveyed who did not support proposal A preferred Ragini as student union president = 300 – 90 = 210

$$\text{Required percentage} = \frac{210}{250} \times 100\% = 84\%$$

45. (a)

Number of students who supported both proposals A and B = 100

Number of the students surveyed who supported both proposals A and B and preferred Sunita as student union president = 50

$$\therefore \text{Required \%} = \frac{50}{100} \times 100\% = 50\%$$

46. (c)

Number of students surveyed supported proposal B, did not support proposal A and preferred Ragini as student union president.

= Number of students who supported proposal B and preferred Ragini

– Number of students who supported proposal A and B and preferred Ragini = 200 – 50 = 150

47. (c)

Since clinic is open for from 9 a.m. to 11.30 a.m. i.e. for 150 mins, hence maximum number of patients for each doctor will be as follows

$$\text{Ben} = 150/10 = 15$$

$$\text{Kane} = 150/15 = 10$$

$$\text{Wayne} = 150/25 = 6$$

$$\text{Total} = 15 + 10 + 6 = 31$$

48. (a)

When queue is never empty on one particular Saturday, then

Ben would earned =  $15 \times 100 = 1500$

Kane would earned =  $10 \times 200 = 2000$

Wayne would earned =  $6 \times 300 = 1800$

Hence, maximum amount would be earned by Dr. Kane

49. (c)

Doctor's Name	At the end of the 50th minute on each day	
	Number of patients already seen	Continue seeing or from to see a new patient
Ben	5	Free to see a new patient
Kane	3	Continue seeing a new patient
Wayne	2	Free to see a new patient

To stay for the maximum time in the clinic the 13th numbered patient must go in the room of Dr. Wayne.

As 12th and 13th number of patient will visited by one of the doctors Dr. Ben or Dr. Wayne. So for 13th no of patient to visit Dr. Wayne, Dr. Wayne must be in the room which is numbered higher than Dr. Ben's room number. It is happening only on Monday when Dr. Ben is in room 1 and Dr. Wayne is in room 3.

So Monday is correct answer.

50. (c)

Tuesday		
Room No. 1	Room No. 2	Room No. 3
Dr. Wayne	Dr. Ben	Dr. Kane
Patient No. 1 9.00 – 9.25	Patient No. 2 9.00 – 9.10	Patient No. 4 9.15 – 9.30
Free 9.25 – 9.30	Free 9.10 – 9.15	Free 9.30 – 9.45
Patient No. 5 9.30 – 9.55	Patient No. 3 9.15 – 9.25	Patient No. 8 9.45 – 10.00
Free 9.55 – 10.00	Free 9.25 – 9.30	Free 10.00 – 10.15
Patient No. 9 10.00 – 10.25	Patient No. 6 9.30 – 9.40	Patient No. 12 10.15 – 10.30
	Free 9.40 – 9.45	
	Patient No. 7 9.45 – 9.55	
	Free 9.55 – 10.00	
	Patient No. 10 10.00 – 10.10	
	Free 10.10 – 10.15	
	Patient No. 11 10.15 – 10.25	

If you continue filling the above table till 11.30 a.m. as filled in the table, you can easily see that all 3 doctors will never be free at same time.

Hence 0 is the correct option.

Sol. (51-54):

	Column 1	Column 2	Column 3	Total
Row 1	2, a, 4	6, b, 8	1, c, 3	$24 + a + b + c$
Row 2	3, d, 5	1, 1, 1	6, e, 20	$37 + d + e$
Row 3	1, 1, 2	1, f, 2	2, g, 5	$14 + f + g$
Total	$18 + a + d$	$20 + b + f$	$37 + c + e + g$	

Here, a to g are number of coins in pouches in respective cells.

From given condition, we can find the minimum and maximum values of sum of variables a to g

	Min	Max	
a+b+c	9	15	...(i)
d+e	9	25	...(ii)
g+f	3	7	...(iii)
a+d	5	9	...(iv)
b+f	7	10	...(v)
c+e+g	9	25	...(vi)

Now, Average amount of money kept in the nine pouches in any row or any column is an integer. So, Sum of coins of any row or any column must be multiple of 9.

$$18 + a + d = 9.K_1 \quad \dots(\text{vii})$$

$$20 + b + f = 9.K_2 \quad \dots(\text{viii})$$

$$37 + c + e + g = 9.K_3 \quad \dots(\text{ix})$$

$$14 + f + g = 9.K_4 \quad \dots(\text{x})$$

$$37 + d + e = 9.K_5 \quad \dots(\text{xi})$$

$$24 + a + b + c = 9.K_6 \quad \dots(\text{xii})$$

Here  $(K_1, K_2, \dots, K_6)$  are integer

From equation (v) and (viii)

We check values between min and max of  $(b + f)$

= (7, 10), for which, we get  $K_2$  as integer

$$\therefore b + f = 7 \quad \dots(\text{xiii})$$

Doing the same procedure, we get following eqn.

$$a + d = 9 \quad \dots(\text{xiv})$$

$$d + e = 17 \quad \dots(\text{xv})$$

$$g + f = 4 \quad \dots(\text{xvi})$$

$$a + b + c = 12 \quad \dots(\text{xvii})$$

$$c + e + g = 17 \quad \dots(\text{xviii})$$

Now, on solving equation (xiv) to (xviii), we get

$$a = 4, b = 6, c = 2, d = 5, e = 12, f = 1, g = 3$$



51. (13)

Total money in first column, second row  
 $= 3 + d + 5 = 3 + 5 + 5 = 13$

52. (8)

Total 8 pouches contains 1 coin

53. (2)

For slot  $R_1, C_3$ ,  $\frac{1+C+3}{3} = \frac{1+2+3}{3} = 2$

For slot  $R_2, C_2$ ,  $\frac{1+1+1}{3} = 1$

54. (3)

For slot  $R_1, C_2$ , total amount  $= 6 + 6 + 8 = 20$

For slot  $R_2, C_1$ , total amount  $= 3 + 5 + 5 = 13$

For slot  $R_2, C_3$ , total amount  $= 6 + 12 + 20 = 38$

Sol. (55-58):

Presenting the point situation as per the conditions given in the Problem:

	Rounds Played 1 – 6	Rounds Played 7 – 10	Points after Round 6	Points in Rounds 1-6	Points in Rounds 7-10		Points after Round 10
<b>Amita</b>	1 6	7 8 9 10	8	7 1 1 1 1 1	7 0 0 3	10	18
<b>Bala</b>	12	7 8 9 10	2	1 1 1 1 1 1	0 0 3 0	3	5
<b>Chen</b>	123	8 9 10	3	3? 3? 0 1 1 1	1 1 1 1	3	6
<b>David</b>	1234	9 10	6	3? 3? 0 3 1 1	1 1 0 0	0	6
<b>Eric</b>	12345	10	3	0 0 3 0 0 1	1 1 1 0	7	10
<b>Fatima</b>	123456		10	0 0 7 0 3 0		0	10
<b>Gordon</b>	23456	7	17	1 7 0 7 0 3	0 1 1 1	0	17
<b>Hansa</b>	3456	7 8	1	1 1 1 0 0 0	0 3 1 1	3	4
<b>Ikea</b>	456	7 8 9	2	1 1 1 1 1 0	1 7 7 1	15	17
<b>Joshin</b>	56	7 8 9 10	14	1 1 1 7 7 1	3 0 0 0	3	17

Reasoning for Round 1-6	For Round 7-10
<ul style="list-style-type: none"> <li><b>J</b> scores 7 in Round 5 &amp; 6 both as his score is 14 and he plays only these 2 rounds. Similarly <b>B</b> scores 1 each in Rounds 1 &amp; 2.</li> <li><b>A</b> scored 7 in Round 1 &amp; 1 in Round 6 as <b>J</b> scored 7 in Round 6</li> <li>As <b>G</b> didn't score in any 2 consecutive rounds so he scored 7,0,7,0,3 (scoring rounds may differ). <b>G</b> scored 7 in Round 2, 7 in Round 4 &amp; 3 in Round 6 as <b>J</b> scores 7 in Round 6.</li> <li>In Round 3 only <b>F</b> or <b>G</b> (who have scored 7 can be winners. But <b>G</b> is already winner of Rounds 2 &amp; 4. So <b>F</b> wins Round 3.</li> <li>The 3<sup>rd</sup> positions are taken by <b>A</b>, <b>B</b> (2), <b>H</b> &amp; <b>I</b> (2) so the 2<sup>nd</sup> positions will be taken by <b>C</b>, <b>D</b> (2). <b>E</b>, <b>F</b> &amp; <b>G</b>.</li> <li><b>I</b> scores 1 in two of rounds 4, 5 &amp; 6. As <b>A</b> scores 1 in Round 6 so <b>I</b> scores 1 in 4 &amp; 5 Rounds.</li> <li><b>H</b> has scored 1 in Round 3, as <b>I</b> scores 1 in round 4 &amp; 5 and <b>A</b> scores 1 in Round 6.</li> <li>As <b>E</b> &amp; <b>F</b> scored in the same round so <b>E</b> scores 3 in Round 3. They cannot score 3 in the same round.</li> <li>As <b>E</b> scores a 3 in Round 3, <b>G</b> in Round 6 so the only possible option to score a 3 in Round 5 is <b>F</b>. Similarly <b>D</b> has to score a 3 in Round 4.</li> <li>The 3<sup>rd</sup> position in Rounds 1 &amp; 2 will be shared by <b>C</b> &amp; <b>D</b>. There is no sufficient Data to support it.</li> </ul>	<ul style="list-style-type: none"> <li><b>C</b> (8, 9, 10) &amp; <b>I</b> (7, 8, 9) scored in 3 consecutive rounds. <b>C</b> is given and <b>I</b> can score 15 only by winning in all 3 rounds. So <b>C</b> scored 1 in 8, 9 &amp; 10 and <b>I</b> score 1 in Round 7 &amp; 7 each in Round 8 &amp; 9</li> <li>As <b>C</b> has won the third position in Rounds 8, 9, 10 so the remaining 3<sup>rd</sup> position of Round 7 can be won by <b>I</b> only.</li> <li>So <b>B</b>, <b>H</b> &amp; <b>J</b> will take the 2<sup>nd</sup> position (score 3) in 1 round each. As <b>J</b> scores in round 7 so he scores a 3 in it. So <b>H</b> has to score 3 in Round 8 and <b>B</b> in Round 9.</li> <li><b>E</b> scores a 7 in Round 10 so <b>A</b> will score a 7 in Round 7; also <b>A</b> will score 3 in Round 10 (given).</li> <li><b>J</b> Scored 3 in Round 7 (given), so <b>H</b> scores 3 in 8 (plays 7 &amp; 8 only) and <b>B</b> in 9.</li> </ul>

Positions in each Round			
Round	I	II	III
1	Amita	Chen / David	Bala
2	Gordon	David / Chen	Bala
3	Fatima	Eric	Hansa
4	Gordon	David	Ikea
5	Joshin	Fatima	Ikea
6	Joshin	Gordon	Amita
7	Amita	Joshin	Ikea
8	Ikea	Hansa	Chen
9	Ikea	Bala	Chen
10	Eric	Amita	Chen

55. (b) Chen = 3 (scored either in Round 1/ 2);  
David = 3 (scored either in Round 2/ 1);  
E = 3 (Round 3)
56. (c) Amita = 7, Bala = 2, Chen = 3; David = 6;  
Eric = 3, Fatima = 7, Gordon = 14, Hansa = 1,  
Ikea = 1; Joshin does not play any of the 4 rounds.
57. (d) From above table Ikea scored 5 times (maximum)
58. (c) Eric, Amita & Chen scored in Round 10.

**Sol. (59-62):**

From points (1) and (5), the persons in Team 1 speak English, Chinese, Arabic and French. (Robert speaks both Arabic and French).

Again from points (1) and (5), the persons in Team 3 speak, English, Chinese and Dutch. (Quentin speaks Dutch and English). Since each person speaks two Languages and each team speaks exactly four languages, we need to find one person for Team 3, who speaks one language among English, Chinese and Dutch and a different language apart from these three.

Since, Paula and Sally together speak Basque, Chinese and English and they are together in exactly two teams, they cannot be in Team 1. They must be in Teams 2 and 3.

Hence, from point (5) and the above, Paula, Quentin and Sally, (Basque, Chinese, Dutch and English) are in Team 3. Since there are three persons in Team 3, Teams 1 and 2 should also have three persons each. Team 1 speaks, English, Chinese, Arabic and French. Robert (Arabic and French) is one of the team members. Now, two more persons, who speak languages among the above four are to be selected. It is possible only with Paula and Terence.

From point (2) Basque and French are spoken by two teams. Hence, Team 2 speaks these two languages Paula and Sally are there in Team 2 (Basque, Chinese and English). We need to find one more person, who speaks one of these three languages and French. It is possible with only Terence.

Team	1	2	3
Persons	Robert, Paula, Terence	Paula, Sally, Terence	Quentin, Paula, Sally

Languages	Arabic, Chinese, English, French	Basque, Chinese, English, French	Basque, Chinese, Dutch, English
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59. (a) Quentin is not a member of Team 2.
60. (c) Sally is part of exactly two teams 2 and 3
61. (b) Paula is a member of all the teams.
62. (d) Apart from Chinese and English, Team 1 speaks Arabic and French

**Sol. (63-66):**

63. (a) Heavy monsoon states (i.e. the states having rainfall greater than 900) and negative deviations are Arunachal, Kerala, Meghalaya
- Heavy monsoon states (i.e. the states having rainfall greater than 900) and positive deviations are Maharashtra, Mizoram, Sikkim, Goa

$$\text{Hence required percentage} = \left( \frac{3}{3+4} \right) \times 100 = 42.86$$

64. (c) There are 9 states Gujarat, Karnataka, Rajasthan, MP, Assam, WB, Jharkhand, Delhi and Manipur with low monsoon having deviation from LPA  
25%, 20%, 15%, 10%, -10%, -30%, -35%, -40% and -60% respectively
- The state of Assam will have the median value = -10%

65. (a) There are only 5 states where rainfall are 600 mm or less in 2019. These states are Assam, WB, Jharkhand, Delhi and Manipur having rainfall 600, 600, 400, 300 and 400 respectively and negative deviation.

So, Required average of states with rainfall less than 600 and negative deviation is  $(600 + 600 + 400 + 300 + 400)/5 = 460$

66. (d) 2009 rainfall is  $600/1.2 = 500$  mm. Gujarat in 2018 has rainfall of 600 and deviation of 25% and 2019 is 20% more than 2009

As deviation is +25%, so average 2009 - 2018 is  $600/1.25 = 480$

LPA 2019 =  $(480 \times 10 - 500 + 600) / 10 = 490$  mm

67. (4851) The sequence  $(2n + 1) + (2n + 3) + (2n + 5) + \dots + (2n + 47) = 5280$
- is in A.P. with first term  $(a) = 2n + 1$   
common difference  $(d) = 2$  and last term  $(l) = 2n + 47,$

Let 'm' be the number of terms in this sequence, then

$$l = a + (m - 1)d$$

$$2n + 47 = (2n + 1) + (m - 1)(2) \Rightarrow m = 24$$

$$\text{Now, } (2n + 1) + (2n + 3) + (2n + 5) + \dots + (2n + 47) = 5280$$

$$\Rightarrow \frac{24}{2}[2(2n + 1) + (24 - 1) \times 2] = 5280$$

$$\left[ \because S_n = \frac{n}{2}[2a + (n - 1)d] \right]$$

$$\Rightarrow 24(2n + 1 + 23) = 48(n + 12) = 5280$$

$$\Rightarrow 48(n + 12) = 5280$$

$$\therefore n = 98$$

$$\text{Now, } 1 + 2 + 3 + \dots + n = \frac{n(n + 1)}{2} = \frac{98 \times 99}{2} = 4851$$

68. (a)

Let number of fiction and non-fiction books in 2010 be  $x$  and  $y$  respectively

From the first condition

$$x + y = 11,500 \quad \dots(i)$$

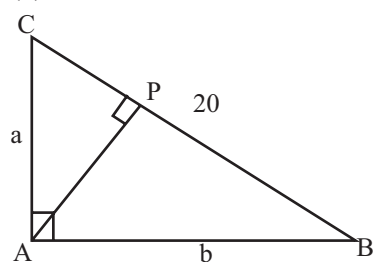
From the second condition

$$1.1 \times x + 1.12 \times y = 12760 \quad \dots(ii)$$

Solving equations (i) and (ii) we get  $x = 6000$

$$\therefore \text{In 2015, the number of fiction books} = 1.1x = 6600$$

69. (d)



In  $\triangle ABC$ , let  $AC = a$  and  $AB = b$

Then by pythagoras theorem for  $\triangle ABC$ ,

$$a^2 + b^2 = 20^2 = 400 \quad \dots(i)$$

In  $\triangle ABC$  and  $\triangle PAC$ ,

$$\angle BAC = \angle APC (= 90^\circ)$$

$$\angle C = \angle C \text{ (common)}$$

$$\therefore \triangle ABC \sim \triangle PAC \text{ (by AA)}$$

$$\therefore \frac{AB}{PA} = \frac{BC}{AC} \quad \left[ \text{Ratio of corresponding sides of two similar triangles are equal} \right]$$

$$\Rightarrow \frac{b}{AP} = \frac{20}{a}$$

$$AP = \frac{ab}{20} \quad \dots(ii)$$

For maximum value of  $AP$ , we have to maximize the product  $ab$ .

Applying  $AM \geq GM$  inequality, we get

$$\frac{a^2 + b^2}{2} \geq \sqrt{a^2 \times b^2}$$

$$\Rightarrow \frac{400}{2} \geq ab$$

$$\Rightarrow ab \leq 200$$

Hence, the maximum value of  $ab = 200$

From eq. (ii), it is clear that value of  $AP$  will be maximum when value of  $ab$  will be maximum

$$\therefore \text{maximum value of } AP = \frac{200}{20} = 10$$

70. (b)

Initial amount of salt in vessel  $A = 10$  gms per 100 ml. solution. Therefore in 500 ml solution in vessel amount of salt = 50 gms

Similarly, initially in 500 ml solution in vessel  $B$  amount of salt = 110 gms

and initially in 500 ml solution in vessel  $C$ , amount of salt = 160 gms

When 100 ml is transferred from  $A$  to  $B$ , the amount of salt now in  $B = 10 + 110 = 120$  gms in 600 ml.

$$\text{The new concentration of salt in } B = \frac{120}{600} \times 100$$

$$= 20 \text{ gms per 100 ml.}$$

Now, the amount of salt in  $A = 50 - 10 = 40$  gms in 400 ml

Now, when 100 ml is transferred from  $B$  to  $C$ , the amount of salt now in  $C = 20 + 160 = 180$  gms in 600 ml.

$$\text{The new concentration of salt } C = \frac{180}{600} \times 100$$

$$= 30 \text{ gms per 100 ml}$$

Finally, when 100 ml is transferred from  $C$  to  $A$ , the amount of salt now in  $A = 30 + 40 = 70$  gms in 500 ml.

$$\therefore \text{Strength of salt in } A = \frac{70}{500} \times 100 = 14$$

71. (20)

Both the given sequences are A.P.

The common difference for the first sequence,  $d_1 = 4$

The common difference for the second sequence,  $d_2 = 5$

The first common term in the two given A.P. is 19.

The common terms will also be in arithmetic progression with common difference

$$\text{LCM}(d_1, d_2) = \text{LCM}(4, 5) = 20$$

Let there be 'n' terms in this sequence, then the last term would be  $\leq 415$

Hence for A.P. of common terms

$$a + (n - 1)d \leq 415$$

$$\Rightarrow 19 + (n - 1) \times 20 \leq 415$$

$$\Rightarrow (n - 1) \times 20 \leq 396$$

$$\Rightarrow (n - 1) = \left[ \frac{396}{20} \right], \text{ where } [] \text{ is the greatest integer}$$

$$\Rightarrow (n - 1) = 19$$

$$\therefore n = 20$$

## 72. (20920)

Let the amount invested by Bimal be ₹  $P$

Since the interest earned by both Anil and Bimal are equal, therefore,

$$\left[ 12000 \left( 1 + \frac{8}{100} \right) - 12000 \right] + \left[ 10000 \left( 1 + \frac{3}{100} \right)^2 - 10000 \right] = \frac{P \times 7.5 \times 1}{100}$$

$$\Rightarrow 12000 \times \left( \frac{27}{25} - 1 \right) + 10000 \left[ \left( \frac{103}{100} \right)^2 - 1 \right] = \frac{P \times 15}{200}$$

$$\Rightarrow 12000 \times \frac{2}{25} + 10000 \times \left( \frac{10609 - 10000}{10000} \right) = \frac{3P}{40}$$

$$\Rightarrow 960 + 609 = \frac{3P}{40} \Rightarrow P = \frac{1569 \times 40}{3} = 20920$$

## 73. (b)

$$2^{6x} + 2^{3x+2} - 21 = 0$$

$$\Rightarrow 2^{6x} + 2^{3x} \times 2^2 - 21 = 0$$

$$\text{Put } 2^{3x} = y, \text{ then } y^2 + 4y - 21 = 0$$

$$\Rightarrow (y - 3)(y + 7) = 0 \Rightarrow y = 3 \text{ or } y = -7$$

$$\Rightarrow 2^{3x} = 3 \text{ or } 2^{3x} = -7 \text{ (No solution)}$$

$$\Rightarrow 3x = \log_2 3 \Rightarrow x = \frac{\log_2 3}{3}$$

## 74. (48)

$$\text{Speed of John} = 6 \text{ kmph} = 6 \times \frac{5}{18} \text{ m/s} = \frac{5}{3} \text{ m/s}$$

$$\text{Speed of Mary} = 7.5 \text{ kmph} = 7.5 \times \frac{5}{18} = \frac{25}{12} \text{ m/s}$$

Let the track length of  $A$  and  $B$  be  $x$  and  $y$  respectively

$$\text{Given, } x + y = 325 \quad \dots(i)$$

Time taken by John to cover one round of track

$$A = \frac{x}{\frac{5}{3}} \text{ sec}$$

Therefore, time taken to cover 9 rounds of track  $A$

$$= 9 \times \frac{x}{\frac{5}{3}} = \frac{27}{5} x \text{ sec}$$

$$\text{Time taken by Mary to cover one round of track } B = \frac{y}{\frac{25}{12}} \text{ sec}$$

Therefore, time taken to cover 5 rounds of track  $B$

$$= 5 \times \frac{y}{\frac{25}{12}} = \frac{12}{5} y \text{ sec}$$

According to the question,

$$\frac{27}{5} x = \frac{12}{5} y \Rightarrow y = \frac{9}{4} x \quad \dots(ii)$$

Put the value of  $y$  in (i)

$$x + \frac{9}{4} x = 325$$

$$\Rightarrow 13x = 1300 \Rightarrow x = 100$$

$\therefore$  Time taken by Mary to cover one round of track  $A$

$$= \frac{100}{\frac{25}{12}} = 48 \text{ sec}$$

## 75. (a)

$$\frac{n^2 + 7n + 12}{n^2 - n - 12} = \frac{(n+3)(n+4)}{(n-4)(n+3)} = \frac{(n+4)}{(n-4)}$$

$$\Rightarrow \frac{(n+4)}{(n-4)} = \frac{(n-4+8)}{(n-4)} = 1 + \frac{8}{(n-4)}$$

The expression is positive integer if  $\frac{8}{(n-4)}$  is non-negative integer.

For this  $(n-4)$  must be factor of 8.

For  $n$  to be largest,  $n-4 = 8$

$$\therefore n = 12$$

## 76. (c)

We know that the quadratic equation  $ax^2 + bx + c = 0$  has real and distinct roots, if  $b^2 - 4ac > 0$

Hence for real and distinct roots of

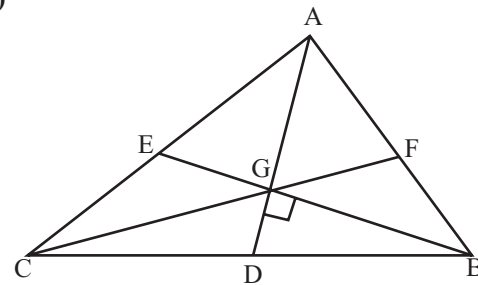
$$x^2 - 4x - \log_2 A = 0, D > 0$$

$$\therefore (-4)^2 - 4 \times 1 \times (-\log_2 A) > 0$$

$$\Rightarrow 16 + 4 \log_2 A > 0 \Rightarrow \log_2 A > -4$$

$$\Rightarrow A > 2^{-4} \Rightarrow A > \frac{1}{16}$$

## 77. (d)



Draw the third median  $CF$ . We know the following facts.

(i) The intersection point of medians i.e. centroid ( $G$ ) divides each median into 2:1

$$\therefore GD = \frac{1}{3} \times AD = \frac{1}{3} \times 12 = 4$$

$$\text{and } GB = \frac{2}{3} \times BE = \frac{2}{3} \times 9 = 6$$

(ii) All three medians divide the triangle into 6 parts of equal area.



Now, Area of triangle  $BGD = \frac{1}{2} \times GB \times GD = \frac{1}{2} \times 6 \times 4 = 12$

$$\therefore \text{area of triangle } ABC = 6 \times (\text{Area of } \triangle BGD) \\ = 6 \times 12 = 72$$

78. (80)

Let score of  $A, B, C$  and  $D$  are  $a, b, c$  and  $d$  respectively.

Score of  $A = 72$ ,

$$\therefore a = 72$$

$$\text{Also } a = 0.9 \times b \Rightarrow b = a/0.9 = 72/0.9 = 80$$

$$\text{and } b = 1.25 \times c \Rightarrow c = b/1.25 = 80/1.25 = 64$$

$$\text{and } c = 0.8 \times d \Rightarrow d = c/0.8 = 64/0.8 = 80$$

Hence score of  $D = 80$

79. (4)

$$m^2 + 105 = n^2 \Rightarrow n^2 - m^2 = 105$$

$$\Rightarrow (n - m)(n + m) = 105$$

Since  $m$  and  $n$  are positive integers  $(n - m) < (n + m)$ , then by splitting 105 in two factors, we get

$$\Rightarrow (n - m)(n + m) = 1 \times 105$$

$$\text{For } (n - m) = 1 \text{ and } (n + m) = 105, (m, n) = (52, 53)$$

$$\Rightarrow (n - m)(n + m) = 3 \times 35$$

$$\text{For } (n - m) = 3 \text{ and } (n + m) = 35, (m, n) = (16, 19)$$

$$\Rightarrow (n - m)(n + m) = 5 \times 21$$

$$\text{For } (n - m) = 5 \text{ and } (n + m) = 21, (m, n) = (8, 13)$$

$$\Rightarrow (n - m)(n + m) = 7 \times 15$$

$$\text{For } (n - m) = 7 \text{ and } (n + m) = 15, (m, n) = (4, 11)$$

Hence, there are four required pairs.

**Shortcut approach :**

$$\text{Number of pairs} = \frac{\text{number of factors } 105}{2}$$

$$105 = 3 \times 5 \times 7$$

Factors of 105 are 1, 3, 5, 7, 15, 21, 35 and 105

Number of factors of 105 = 8

$$\text{Hence, required number of pairs} = \frac{8}{2} = 4$$

80. (7)

Let the number be  $ABCDEF$ , where  $A, B, C, D, E$  and  $F$  be the digits

$$\text{Now, } C = A, B = 2A$$

$$F = A + B + C = A + 2A + A = 4A, E = A + B = A + 2A = 3A$$

$$\text{and } D = E + F = 3A + 4A = 7A$$

Since  $A$  and  $D$  both are digit, the maximum possible value of  $A = 1$ . Therefore, the maximum value of  $D = 7$

81. (d)

Let be cost of each bicycle be  $x$ .

According to the given condition,

$$10x + 2000 = 6 \times 1.25x + 4 \times 0.75x$$

$$\Rightarrow x = 4000$$

Hence purchase price of a bicycle of Mukesh = ₹4000

82. (d)

Since scores of Anjali, Mohan and Rama after review were in the ratio of 11 : 10 : 3, therefore we can suppose scores

of Anjali, Mohan and Rama after review be  $11x, 10x$  and  $3x$  respectively.

Therefore, their scores before review was  $(11x - 6), (10x - 6)$  and  $(3x - 6)$  respectively.

Since, Rama's score was one-twelfth of the sum of the scores of Mohan and Anjali.

$$\therefore (3x - 6) = \frac{1}{12}[(11x - 6) + (10x - 6)]$$

$$\Rightarrow 12(3x - 6) = 21x - 12 \Rightarrow x = 4$$

Now, Anjali's score - Rama's score

$$= (11x - 6) - (3x - 6) = 8x = 8 \times 4 = 32$$

83. (c)

LCM of 20 and 40 = 40

Let the work be of 40 units

Amount of work done by Anil in one day =  $40/20 = 2$  units

$$\text{Amount of work done by Sunil in one day} = \frac{40}{40} = 1 \text{ units}$$

Bimal does 10% work i.e. 4 units work

Rest  $40 - 4 = 36$  units is done by Anil and Sunil.

Let Anil took  $x$  days. Therefore, Sunil took  $(x - 3)$  days.

$$\text{Therefore } 2 \times x + 1 \times (x - 3) = 36 \Rightarrow x = 13 \text{ days.}$$

Hence, the job was done in 13 days.

84. (b)

Time taken by cyclist to cover the distance  $AB = 60$  min

Given, starting from 10:01 am, every minute a motor cycle leaves A and moves towards B.

Forty-five such motor cycles reach B by 11 am.

Also, the speed of all the motor cycles is same

This means that the 45th motor cycle, which started at 10:45 am, reached B exactly at 11 am, Rest all reached B some time before B.

Therefore, each motor cycle takes 15 min to cover the distance AB.

Now, if the cyclist doubles his speed, then he will reach B in 30 min i.e. at 10:30 am.

So, the 15th motor cycle (started at 10:15 am from A) would be the last motor cycle that reach to point B at 10:30 am.

Hence, when the cyclist had doubled his speed, then there will be 15 motor cycles would have reached B by the time the cyclist reached B.

85. (c)

The given expression will be real only if  $\log_e \frac{4x - x^2}{3} \geq 0$

$$\Rightarrow \frac{4x - x^2}{3} \geq e^0 \Rightarrow \frac{4x - x^2}{3} \geq 1$$

$$\Rightarrow 4x - x^2 \geq 3 \Rightarrow x^2 - 4x + 3 \leq 0$$

$$\Rightarrow (x - 1)(x - 3) \leq 0 \Rightarrow 1 \leq x \leq 3$$

86. (13)

Consider the second given equation

$$5^{x-1} + 3^{y+1} = 9686 \quad \dots(i)$$

Last digit of  $5^{x-1}$  will always be 5 for all positive integral values of  $(x-1)$ 

The power cycle of 3 is

$$3^{4k+1} \equiv 3$$

$$3^{4k+2} \equiv 9$$

$$3^{4k+3} \equiv 7$$

$$3^{4k} \equiv 1$$

Clearly  $3^{y+1}$  must be in the form of  $3^{4k}$  as the unit digit of R.H.S. = 6 of eq. (i)We have  $3^4 = 81$ , and  $3^8 = 6561$ Also,  $9686 - 81 = 9605$  and  $9686 - 6561 = 3125$ We observe that  $3125 = 5^5$ 

$$\therefore 5^{x-1} = 5^5 \Rightarrow x = 6$$

$$\text{and } 3^{y+1} = 3^8 \Rightarrow y = 7$$

 $x = 6$  and  $y = 7$  also satisfies the first given equation

$$5^x - 3^y = 13438$$

$$\therefore x + y = 6 + 7 = 13$$

87. (c)

Let the track length be  $10x$ When they meet at 10 am, ant A travelled  $6x$  of the distance and ant B travelled  $4x$  of the distance.

$$\text{Therefore, } \frac{\text{Speed of ant A}}{\text{Speed of ant B}} = \frac{6x}{4x} = \frac{3}{2}$$

$$\text{Speed of ant B} = \frac{2}{3} \times \text{speed of ant A}$$

$$\text{i.e. } S_B = \frac{2}{3} S_A$$

The distance covered by ant A from meeting point to point

 $P$  was  $4x$ . Similarly, the distance covered by ant B from meeting point to point  $P$  was  $6x$ .Given, ant A took 12 min to reach  $P$ .

$$\therefore S_A = \frac{4x}{12} = \frac{x}{3}$$

$$\text{and } S_B = \frac{2}{3} S_A = \frac{2}{3} \times \frac{x}{3} = \frac{2x}{9}$$

Time taken by ant B to travelled the  $6x$  distance to reach at  $P$ 

$$= \frac{6x}{\frac{2x}{9}} = 27 \text{ min.}$$

Therefore ant B reaches  $P$  at 10:27 am.

88. (c)

Sum of roots  $= 4a + 3a = 7a = -b$ 

$$\therefore b = -7a$$

Product of roots  $= 4a \times 3a = c$ 

$$\therefore c = 12a^2$$

$$\text{Now, } b^2 + c = (-7a)^2 + 12a^2 = 61a^2$$

Comparing the options

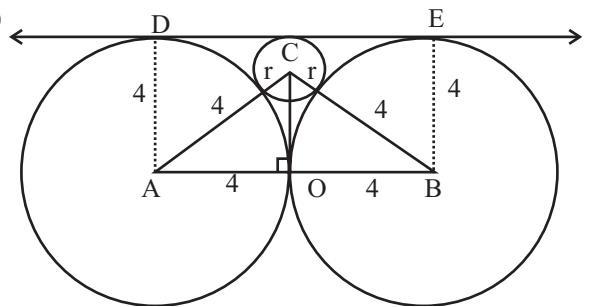
**Option (a)** :  $61a^2 = 3721 \Rightarrow a^2 = 61$ , clearly  $a$  is not an integer.**Option (b)** :  $61a^2 = 361 \Rightarrow a^2 = \frac{361}{61}$ , clearly  $a$  is not an integer.**Option (c)** :  $61a^2 = 549 \Rightarrow a^2 = 9$ , we can have  $a = -3$  or  $3$  (an integer)**Option (d)** :  $61a^2 = 427 \Rightarrow a^2 = 7$ , clearly  $a$  is not an integer

89. (b)

We can take  $a = 5$ ,  $b = 0$ ,  $x = 13$  and  $y = 0$  as these values that satisfies all three equations

$$\therefore k = ay - bx = 5 \times 0 - 0 \times 13 = 0$$

90. (d)

From the figure,  $OC = AD - r = 4 - r$ 

Applying Pythagoras theorem in right triangle AOC, we get

$$AC^2 = AO^2 + OC^2$$

$$\Rightarrow (4 + r)^2 = 4^2 + (4 - r)^2$$

$$\Rightarrow (4 + r)^2 - (4 - r)^2 = 16$$

$$\Rightarrow 8 \times 2r = 16$$

$$\therefore r = 1$$

91. (12)

Let the number of hours for regular and overtime work be  $x$  and  $y$  respectively.

$$\therefore x + y = 172 \quad \dots(i)$$

$$114y = \frac{15}{100} \times 57x$$

$$\Rightarrow 114y = \frac{3}{20} \times 57x$$

$$\Rightarrow 40y = 3x$$

$$\Rightarrow 3x - 40y = 0 \quad \dots(ii)$$

On solving equations (i) and (ii), we get  $x = 160$  and  $y = 12$  $\therefore$  overtime work = 12 hours

92. (d)

Let  $a$  be the average of 20 numbers whose average does not exceed 5.Let  $b$  be the average of rest of the 10 numbers. Clearly,

$b > 5$  i.e. the average of these numbers exceeds 5

Therefore,

$$30 \times 5 = 20a + 10b$$

$$\Rightarrow 2a + b = 15$$

$$\Rightarrow b = 15 - 2a$$

Going by the options, we can say that when  $a = 4.5$ , then  $b = 6$  which satisfies all the conditions.

But when  $a = 5$ , then  $b = 5$  which does not satisfy  $b > 5$

Hence, highest possible value of the required average = 4.5

93. (c)

Let salaries of Ramesh, Ganesh and Rajesh in 2010 be  $6x$ ,  $5x$  and  $7x$  respectively.

Also, let salaries of Ramesh, Ganesh and Rajesh in 2015 be  $3y$ ,  $4y$  and  $3y$  respectively

$$\text{Given, } 3y = 1.25 \times 6x \Rightarrow y = 2.5x$$

$$\therefore \text{Salary of Rajesh in 2015} = 3y = 3 \times 2.5x = 7.5x$$

$$\therefore \text{Percentage increase in salary of Rajesh}$$

$$= \left( \frac{7.5x - 7x}{7x} \right) \times 100 \approx 7$$

94. (44)

$$2^4 \times 3^5 \times 10^4 = 2^8 \times 3^5 \times 5^4$$

For perfect squares, we have to take only even powers of the prime factors of the number

The number of ways 2's can be used is 5 i.e.  $2^0, 2^2, 2^4, 2^6, 2^8$

The number of ways 3's can be used is 3 i.e.  $3^0, 3^2, 3^4$

The number of ways 5's can be used is 3 i.e.  $5^0, 5^2, 5^4$

Therefore, the total number of factors which are perfect squares =  $5 \times 3 \times 3 = 45$

But this also includes the number 1. Hence excluding 1, the required number is  $45 - 1 = 44$ .

95. (a)

$$\text{For } n = 1, a_1 = 1$$

$$\text{For } n = 2, a_1 - a_2 = 2 \Rightarrow a_2 = -1$$

$$\text{For } n = 3, a_1 - a_2 + a_3 = 3 \Rightarrow a_3 = 1$$

$$\text{For } n = 4, a_1 - a_2 + a_3 - a_4 = 4 \Rightarrow a_4 = -1$$

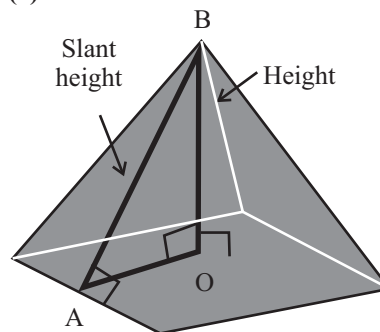
From the above shown pattern, we conclude that each odd term = 1 and each even term = -1

$$\Rightarrow a_{51} + a_{52} + \dots + a_{1022} + a_{1023}$$

$$= (a_{51} + a_{52} + \dots + a_{1022}) + a_{1023}$$

$$= 0 + 1 = 1$$

96. (a)



From the diagram, it is clear that  $AB$  is the slant height of the equilateral triangle and is also the slant height of the pyramid.

$$\therefore AB = \frac{\sqrt{3}}{2} \times \text{side} = \frac{\sqrt{3}}{2} \times 20 = 10\sqrt{3}$$

$$\text{and } AO = \frac{1}{2} \times \text{side} = \frac{1}{2} \times 20 = 10$$

On applying Pythagoras theorem in triangle  $AOB$ ,

$$OB^2 = AB^2 - OA^2 = (10\sqrt{3})^2 - 10^2 = 200$$

$$\therefore \text{Height of the pyramid } OB = 10\sqrt{2} \text{ cm}$$

97. (c)

To find the minimum number of cylinders, the volume of each of the cylinder must be HCF of 405, 783 and 351

$$\text{HCF}(405, 783, 351) = 27$$

Therefore, volume of each cylinder = 27cc

$$\text{Hence number of cylinders of iron} = \frac{405}{27} = 15$$

$$\text{Number of cylinders of aluminium} = \frac{783}{27} = 29$$

$$\text{and number of cylinders of copper} = \frac{351}{27} = 13$$

$$\text{Therefore, the total number of cylinders} = 15 + 29 + 13 = 57$$

Since, volume of each cylinder = 27cc

$$\therefore \pi r^2 h = 27 \Rightarrow \pi \times 3^2 \times h = 27$$

$$\Rightarrow h = \frac{3}{\pi}$$

Now, total surface area of each cylinder =  $2\pi r(r + h)$

$$= 2\pi \times 3 \left( 3 + \frac{3}{\pi} \right) = 18(\pi + 1)$$

$\therefore$  Total surface area of 57 cylinders

$$= 57 \times 18(\pi + 1) \text{ sq. cm.} = 1026(\pi + 1)$$

**98. (b)**Cost of table of Amal =  $1.2p$ Cost of table for Asim =  $0.8p$ Amal sells to Bimal at  $1.3 \times 1.2p = 1.56p$ = cost of table for Bimal =  $x$ Asim sells table to Barun at  $0.7 \times 0.8p = 0.56p$ = cost of table for Barun =  $y$ 

$$\therefore \frac{x-y}{P} = \frac{1.56p-0.56p}{P} = 1$$

**99. (12)**Given  $f(mn) = f(m)f(n)$  and  $f(24) = 54$ 

$$\Rightarrow f(24) = 2 \times 3 \times 3 \times 3$$

$$\Rightarrow f(2 \times 12) = f(2) f(12) = f(2) f(2 \times 6)$$

$$= f(2)f(2)f(6) = f(2) f(2) f(2 \times 3)$$

$$= f(2)f(2)f(2)f(3) = 2 \times 3 \times 3 \times 3$$

Given that  $f(1)$ ,  $f(2)$  and  $f(3)$  are all positive integers hence by comparison, we get

$$f(2) = 3 \text{ and } f(3) = 2$$

Hear we may safely consider  $f(1)=1$ 

$$\text{Now, } f(18) = f(2) (9) = f(2) f(3 \times 3)$$

$$= f(2)f(3)f(3) = 3 \times 2 \times 2 = 12.$$

**100. (150)**The formula for each interior angle =  $180 - \frac{360}{n}$ , where ' $n$ ' is the side of the regular polygon.

$$\text{Now, (an interior angle of B)} = \frac{3}{2} \times (\text{an interior angle A})$$

$$\Rightarrow 180 - \frac{360}{b} = \frac{3}{2} \left( 180 - \frac{360}{a} \right)$$

$$\Rightarrow 180 - \frac{360}{2a} = \frac{3}{2} \left( 180 - \frac{360}{a} \right)$$

$$\Rightarrow 360 - \frac{360}{a} = 540 - \frac{3 \times 360}{a}$$

$$\Rightarrow \frac{2 \times 360}{a} = 180 \Rightarrow a = 4 \text{ and } b = 2a = 8$$

Hence, polygon with each side =  $a + b = 4 + 8 = 12$ , will have each interior angle

$$= 180 - \frac{360}{12} = 150$$



# CAT SOLVED PAPER-2018

## SECTION : VERBAL ABILITY

**DIRECTIONS for the questions:** Read the passage and answer the questions (1-5) based on it.

“Everybody pretty much agrees that the relationship between elephants and people has dramatically changed,” [says psychologist Gay] Bradshaw... “Where for centuries humans and elephants lived in relatively peaceful coexistence, there is now hostility and violence. Now, I use the term ‘violence’ because of the intentionality associated with it, both in the aggression of humans and, at times, the recently observed behavior of elephants.”

Typically, elephant researchers have cited, as a cause of aggression, the high levels of testosterone in newly matured male elephants or the competition for land and resources between elephants and humans. But... Bradshaw and several colleagues argue... that today’s elephant populations are suffering from a form of chronic stress, a kind of species-wide trauma. Decades of poaching and culling and habitat loss, they claim, have so disrupted the intricate web of familial and societal relations by which young elephants have traditionally been raised in the wild, and by which established elephant herds are governed, that what we are now witnessing is nothing less than a precipitous collapse of elephant culture.

Elephants, when left to their own devices, are profoundly social creatures. Young elephants are raised within an extended, multitiered network of doting female caregivers that includes the birth mother, grandmothers, aunts and friends. These relations are maintained over a life span as long as 70 years. Studies of established herds have shown that young elephants stay within 15 feet of their mothers for nearly all of their first eight years of life, after which young females are socialized into the matriarchal network, while young males go off for a time into an all-male social group before coming back into the fold as mature adults.

This fabric of elephant society, Bradshaw and her colleagues [demonstrate], ha[s] effectively been frayed by years of habitat loss and poaching, along with systematic culling by government agencies to control elephant numbers and translocations of herds to different habitats. As a result of such social upheaval, calves are now being born to and raised by ever younger and inexperienced mothers. Young

orphaned elephants, meanwhile, that have witnessed the death of a parent at the hands of poachers are coming of age in the absence of the support system that defines traditional elephant life. “The loss of elephant elders,” [says] Bradshaw... “and the traumatic experience of witnessing the massacres of their family, impairs normal brain and behavior development in young elephants.”

What Bradshaw and her colleagues describe would seem to be an extreme form of anthropocentric conjecture if the evidence that they’ve compiled from various elephant researchers, weren’t so compelling. The elephants of decimated herds, especially orphans who’ve watched the death of their parents and elders from poaching and culling, exhibit behavior typically associated with post-traumatic stress disorder and other trauma-related disorders in humans: abnormal startle response, unpredictable asocial behavior, inattentive mothering and hyperaggression.

[According to Bradshaw], “Elephants are suffering and behaving in the same ways that we recognize in ourselves as a result of violence. Except perhaps for a few specific features, brain organization and early development of elephants and humans are extremely similar.”

1. In the first paragraph, Bradshaw uses the term “violence” to describe the recent change in the human-elephant relationship because, according to him:
  - (a) both humans and elephants have killed members of each other’s species.
  - (b) elephant herds and their habitat have been systematically destroyed by humans.
  - (c) there is a purposefulness in human and elephant aggression towards each other.
  - (d) human-elephant interactions have changed their character over time.
2. Which of the following measures is Bradshaw most likely to support to address the problem of elephant aggression?
  - (a) The development of treatment programmes for elephants drawing on insights gained from treating post-traumatic stress disorder in humans.
  - (b) Studying the impact of isolating elephant calves on their early brain development, behaviour and aggression.
  - (c) Increased funding for research into the similarity of humans and other animals drawing on insights gained from human-elephant similarities.

- (d) Funding of more studies to better understand the impact of testosterone on male elephant aggression.
3. Which of the following statements best expresses the overall argument of this passage?
- The brain organisation and early development of elephants and humans are extremely similar.
  - The relationship between elephants and humans has changed from one of coexistence to one of hostility.
  - Recent elephant behaviour could be understood as a form of species-wide trauma-related response.
  - Elephants, like the humans they are in conflict with, are profoundly social creatures.
4. The passage makes all of the following claims EXCEPT:
- elephants establish extended and enduring familial relationships as do humans.
  - elephant mothers are evolving newer ways of rearing their calves to adapt to emerging threats.
  - the elephant response to deeply disturbing experiences is similar to that of humans.
  - human actions such as poaching and culling have created stressful conditions for elephant communities.
5. In paragraph 4, the phrase, "The fabric of elephant society ... has[s] effectively been frayed by . . ." is:
- a metaphor for the effect of human activity on elephant communities.
  - an exaggeration aimed at bolstering Bradshaw's claims.
  - an accurate description of the condition of elephant herds today.
  - an ode to the fragility of elephant society today.

**DIRECTIONS for the questions:** Read the passage and answer the questions (6-9) based on it.

When researchers at Emory University in Atlanta trained mice to fear the smell of almonds (by pairing it with electric shocks), they found, to their consternation, that both the children and grandchildren of these mice were spontaneously afraid of the same smell. That is not supposed to happen. Generations of schoolchildren have been taught that the inheritance of acquired characteristics is impossible. A mouse should not be born with something its parents have learned during their lifetimes, any more than a mouse that loses its tail in an accident should give birth to tailless mice.

Modern evolutionary biology dates back to a synthesis that emerged around the 1940s-60s, which married Charles Darwin's mechanism of natural selection with Gregor Mendel's discoveries of how genes are inherited. The traditional, and still dominant, view is that adaptations – from the human brain to the peacock's tail – are fully and satisfactorily explained by natural selection (and subsequent inheritance). Yet [new evidence] from genomics, epigenetics and developmental biology [indicates] that evolution is more complex than we once assumed.

In his book *On Human Nature* (1978), the evolutionary biologist Edward O Wilson claimed that human culture is held on a genetic leash. The metaphor [needs revision]. . .

Imagine a dog-walker (the genes) struggling to retain control of a brawny mastiff (human culture). The pair's trajectory (the pathway of evolution) reflects the outcome of the struggle. Now imagine the same dog-walker struggling with multiple dogs, on leashes of varied lengths, with each dog tugging in different directions. All these tugs represent the influence of developmental factors, including epigenetics, antibodies and hormones passed on by parents, as well as the ecological legacies and culture they bequeath.

The received wisdom is that parental experiences can't affect the characters of their offspring. Except they do. The way that genes are expressed to produce an organism's phenotype – the actual characteristics it ends up with – is affected by chemicals that attach to them. Everything from diet to air pollution to parental behaviour can influence the addition or removal of these chemical marks, which switches genes on or off. Usually these so-called 'epigenetic' attachments are removed during the production of sperm and eggs cells, but it turns out that some escape the resetting process and are passed on to the next generation, along with the genes. This is known as 'epigenetic inheritance', and more and more studies are confirming that it really happens. Let's return to the almond-fearing mice. The inheritance of an epigenetic mark transmitted in the sperm is what led the mice's offspring to acquire an inherited fear.

Epigenetics is only part of the story. Through culture and society, [humans and other animals] inherit knowledge and skills acquired by [their] parents... All this complexity, points to an evolutionary process in which genomes (over hundreds to thousands of generations), epigenetic modifications and inherited cultural factors (over several, perhaps tens or hundreds of generations), and parental effects (over single-generation timespans) collectively inform how organisms adapt. These extragenetic kinds of inheritance give organisms the flexibility to make rapid adjustments to environmental challenges, dragging genetic change in their wake – much like a rowdy pack of dogs.

6. Which of the following, if found to be true, would negate the main message of the passage?
- A study indicating the primacy of ecological impact on human adaptation.
  - A study affirming the sole influence of natural selection and inheritance on evolution.
  - A study highlighting the criticality of epigenetic inheritance to evolution.
  - A study affirming the influence of socio-cultural markers on evolutionary processes.
7. The passage uses the metaphor of a dog walker to argue that evolutionary adaptation is most comprehensively understood as being determined by:
- ecological, hormonal, extra genetic and genetic legacies
  - socio-cultural, genetic, epigenetic, and genomic legacies
  - extra genetic, genetic, epigenetic and genomic legacies
  - genetic, epigenetic, developmental factors, and ecological legacies

8. The Emory University experiment with mice points to the inheritance of:  
 (a) personality traits (b) acquired parental fears  
 (c) acquired characteristics (d) psychological markers
9. Which of the following best describes the author's argument?  
 (a) Darwin's and Mendel's theories together best explain evolution  
 (b) Darwin's theory of natural selection cannot fully explain evolution  
 (c) Wilson's theory of evolution is scientifically superior to either Darwin's or Mendel's  
 (d) Mendel's theory of inheritance is unfairly underestimated in explaining evolution

**DIRECTIONS for the questions:** Read the passage and answer the questions (10-14) based on it.

[The] Indian government [has] announced an international competition to design a National War Memorial in New Delhi, to honour all of the Indian soldiers who served in the various wars and counter-insurgency campaigns from 1947 onwards. The terms of the competition also specified that the new structure would be built adjacent to the India Gate – a memorial to the Indian soldiers who died in the First World War. Between the old imperialist memorial and the proposed nationalist one, India's contribution to the Second World War is airbrushed out of existence.

The Indian government's conception of the war memorial was not merely absent-minded. Rather, it accurately reflected the fact that both academic history and popular memory have yet to come to terms with India's Second World War, which continues to be seen as little more than mood music in the drama of India's advance towards independence and partition in 1947. Further, the political trajectory of the postwar subcontinent has militated against popular remembrance of the war. With partition and the onset of the India-Pakistan rivalry, both of the new nations needed fresh stories for self-legitimation rather than focusing on shared wartime experiences.

However, the Second World War played a crucial role in both the independence and partition of India. . . . The Indian army recruited, trained and deployed some 2.5 million men, almost 90,000 of which were killed and many more injured. Even at the time, it was recognised as the largest volunteer force in the war.

India's material and financial contribution to the war was equally significant. India emerged as a major military-industrial and logistical base for Allied operations in south-east Asia and the Middle East. This led the United States to take considerable interest in the country's future, and ensured that this was no longer the preserve of the British government.

Other wartime developments pointed in the direction of India's independence. In a stunning reversal of its long-standing financial relationship with Britain, India finished the war as one of the largest creditors to the imperial power. Such extraordinary mobilization for war was achieved at

great human cost, with the Bengal famine the most extreme manifestation of widespread wartime deprivation. The costs on India's home front must be counted in millions of lives.

Indians signed up to serve on the war and home fronts for a variety of reasons. . . . [M]any were convinced that their contribution would open the doors to India's freedom. The political and social churn triggered by the war was evident in the massive waves of popular protest and unrest that washed over rural and urban India in the aftermath of the conflict. This turmoil was crucial in persuading the Attlee government to rid itself of the incubus of ruling India.

Seventy years on, it is time that India engaged with the complex legacies of the Second World War. Bringing the war into the ambit of the new national memorial would be a fitting – if not overdue – recognition that this was India's War.

10. The author claims that omitting mention of Indians who served in the Second World War from the new National War Memorial is:  
 (a) a reflection of misplaced priorities of the post-independence Indian governments  
 (b) a reflection of the academic and popular view of India's role in the War  
 (c) appropriate as their names can always be included in the India Gate memorial  
 (d) is something which can be rectified in future by constructing a separate memorial
11. In the first paragraph, the author laments the fact that:  
 (a) India lost thousands of human lives during the Second World War  
 (b) the new war memorial will be built right next to India Gate  
 (c) funds will be wasted on another war memorial when we already have the India Gate memorial  
 (d) there is no recognition of the Indian soldiers who served in the Second World War
12. The author suggests that a major reason why India has not so far acknowledged its role in the Second World War is that it:  
 (a) has been focused on building an independent, non-colonial political identity.  
 (b) wants to forget the human and financial toll of the War on the country  
 (c) views the War as a predominantly Allied effort, with India playing only a supporting role  
 (d) blames the War for leading to the momentous partition of the country
13. The phrase "mood music" is used in the second paragraph to indicate that the Second World War is viewed as:  
 (a) a part of the narrative on the ill-effects of colonial rule on India  
 (b) a backdrop to the subsequent independence and partition of the region

- (c) setting the stage for the emergence of the India–Pakistan rivalry in the subcontinent
- (d) a tragic period in terms of loss of lives and national wealth

14. The author lists all of the following as outcomes of the Second World War EXCEPT:

- (a) the large financial debt India owed to Britain after the War
- (b) independence of the subcontinent and its partition into two countries
- (c) large-scale deaths in Bengal as a result of deprivation and famine
- (d) US recognition of India's strategic location and role in the War

**DIRECTIONS for the questions:** Read the passage and answer the questions (15-19) based on it.

The only thing worse than being lied to is not knowing you're being lied to. It's true that plastic pollution is a huge problem, of planetary proportions. And it's true we could all do more to reduce our plastic footprint. The lie is that blame for the plastic problem is wasteful consumers and that changing our individual habits will fix it.

Recycling plastic is to saving the Earth what hammering a nail is to halting a falling skyscraper. You struggle to find a place to do it and feel pleased when you succeed. But your effort is wholly inadequate and distracts from the real problem of why the building is collapsing in the first place. The real problem is that single-use plastic—the very idea of producing plastic items like grocery bags, which we use for an average of 12 minutes but can persist in the environment for half a millennium—is an incredibly reckless abuse of technology. Encouraging individuals to recycle more will never solve the problem of a massive production of single-use plastic that should have been avoided in the first place.

As an ecologist and evolutionary biologist, I have had a disturbing window into the accumulating literature on the hazards of plastic pollution. Scientists have long recognized that plastics biodegrade slowly, if at all, and pose multiple threats to wildlife through entanglement and consumption. More recent reports highlight dangers posed by absorption of toxic chemicals in the water and by plastic odors that mimic some species' natural food. Plastics also accumulate up the food chain, and studies now show that we are likely ingesting it ourselves in seafood.

Beginning in the 1950s, big beverage companies like Coca-Cola and Anheuser-Busch, along with Phillip Morris and others, formed a non-profit called Keep America Beautiful. Its mission is/was to educate and encourage environmental stewardship in the public. At face value, these efforts seem benevolent, but they obscure the real problem, which is the role that corporate polluters play in the plastic problem. This clever misdirection has led journalist and author Heather Rogers to describe Keep America Beautiful as the first

corporate green washing front, as it has helped shift the public focus to consumer recycling behavior and actively thwarted legislation that would increase extended producer responsibility for waste management.

[T]he greatest success of Keep America Beautiful has been to shift the onus of environmental responsibility onto the public while simultaneously becoming a trusted name in the environmental movement.

So what can we do to make responsible use of plastic a reality? First: reject the lie. Litterbugs are not responsible for the global ecological disaster of plastic. Humans can only function to the best of their abilities, given time, mental bandwidth and systemic constraints. Our huge problem with plastic is the result of a permissive legal framework that has allowed the uncontrolled rise of plastic pollution, despite clear evidence of the harm it causes to local communities and the world's oceans. Recycling is also too hard in most parts of the U.S. and lacks the proper incentives to make it work well.

15. It can be inferred that the author considers the Keep America Beautiful organisation:

- (a) an innovative example of a collaborative corporate social responsibility initiative
- (b) a sham as it diverted attention away from the role of corporates in plastics pollution
- (c) a “greenwash” because it was a benevolent attempt to improve public recycling habits
- (d) an important step in sensitising producers to the need to tackle plastics pollution

16. The author lists all of the following as negative effects of the use of plastics EXCEPT the:

- (a) slow pace of degradation or non-degradation of plastics in the environment
- (b) poisonous chemicals released into the water and food we consume
- (c) adverse impacts on the digestive systems of animals exposed to plastic
- (d) air pollution caused during the process of recycling plastics

17. Which of the following interventions would the author most strongly support:

- (a) completely banning all single-use plastic bags
- (b) passing regulations targeted at producers that generate plastic products
- (c) recycling all plastic debris in the seabed
- (d) having all consumers change their plastic consumption habits

18. In the first paragraph, the author uses “lie” to refer to the:

- (a) understatement of the enormity of the plastics pollution problem
- (b) understatement of the effects of recycling plastics
- (c) fact that people do not know they have been lied to
- (d) blame assigned to consumers for indiscriminate use of plastics



19. In the second paragraph, the phrase “what hammering a nail is to halting a falling skyscraper” means:
- relying on emerging technologies to mitigate the ill-effects of plastic pollution
  - focusing on single-use plastic bags to reduce the plastics footprint
  - encouraging the responsible production of plastics by firms
  - focusing on consumer behaviour to tackle the problem of plastics pollution

**DIRECTIONS for the questions:** Read the passage and answer the questions (20-24) based on it.

Economists have spent most of the 20th century ignoring psychology, positive or otherwise. But today there is a great deal of emphasis on how happiness can shape global economies, or — on a smaller scale — successful business practice. This is driven, in part, by a trend in “measuring” positive emotions, mostly so they can be optimized. Neuroscientists, for example, claim to be able to locate specific emotions, such as happiness or disappointment, in particular areas of the brain. Wearable technologies, such as Spire, offer data-driven advice on how to reduce stress.

We are no longer just dealing with “happiness” in a philosophical or romantic sense — it has become something that can be monitored and measured, including by our behavior, use of social media and bodily indicators such as pulse rate and facial expressions.

There is nothing automatically sinister about this trend. But it is disquieting that the businesses and experts driving the quantification of happiness claim to have our best interests at heart, often concealing their own agendas in the process. In the workplace, happy workers are viewed as a “win-win.” Work becomes more pleasant, and employees, more productive. But this is now being pursued through the use of performance-evaluating wearable technology, such as Humanyze or Virgin Pulse, both of which monitor physical signs of stress and activity toward the goal of increasing productivity.

Cities such as Dubai, which has pledged to become the “happiest city in the world,” dream up ever-more elaborate and intrusive ways of collecting data on well-being — to the point where there is now talk of using CCTV cameras to monitor facial expressions in public spaces. New ways of detecting emotions are hitting the market all the time: One company, Beyond Verbal, aims to calculate moods conveyed in a phone conversation, potentially without the knowledge of at least one of the participants. And Facebook [has] demonstrated... that it could influence our emotions through tweaking our news feeds — opening the door to ever-more targeted manipulation in advertising and influence.

As the science grows more sophisticated and technologies become more intimate with our thoughts and bodies, a clear trend is emerging. Where happiness indicators were once used as a basis to reform society, challenging the obsession with money that G.D.P. measurement entrenches, they are increasingly used as a basis to transform or discipline individuals.

Happiness becomes a personal project, that each of us must now work on, like going to the gym. Since the 1970s, depression has come to be viewed as a cognitive or neurological defect in the individual, and never a consequence of circumstances. All of this simply escalates the sense of responsibility each of us feels for our own feelings, and with it, the sense of failure when things go badly. A society that deliberately removed certain sources of misery, such as precarious and exploitative employment, may well be a happier one. But we won’t get there by making this single, often fleeting emotion, the over-arching goal.

20. From the passage we can infer that the author would like economists to:
- incorporate psychological findings into their research cautiously
  - measure the effectiveness of Facebook and social media advertising
  - work closely with neuroscientists to understand human behaviour
  - correlate measurements of happiness with economic indicators
21. In the author’s opinion, the shift in thinking in the 1970s:
- put people in touch with their own feelings rather than depending on psychologists
  - was a welcome change from the earlier view that depression could be cured by changing circumstances
  - reflected the emergence of neuroscience as the authority on human emotions
  - introduced greater stress into people’s lives as they were expected to be responsible for their own happiness
22. The author’s view would be undermined by which of the following research findings?
- A proliferation of gyms that are collecting data on customer well-being
  - There is a definitive move towards the adoption of wearable technology that taps into emotions
  - Stakeholders globally are moving away from collecting data on the well-being of individuals
  - Individuals worldwide are utilising technologies to monitor and increase their well-being
23. According to the author, wearable technologies and social media are contributing most to:
- making individuals aware of stress in their lives
  - depression as a thing of the past
  - happiness as a “personal project”
  - disciplining individuals to be happy
24. According to the author, Dubai:
- is on its way to becoming one of the world’s happiest cities
  - incentivises companies that prioritise worker welfare
  - develops sophisticated technologies to monitor its inhabitants’ states of mind
  - collaborates with Facebook to selectively influence its inhabitants’ moods

**DIRECTIONS for the question:** Identify the most appropriate summary for the paragraph.

25. Artificial embryo twinning is a relatively low-tech way to make clones. As the name suggests, this technique mimics the natural process that creates identical twins. In nature, twins form very early in development when the embryo splits in two.

Twinning happens in the first days after egg and sperm join, while the embryo is made of just a small number of unspecialized cells. Each half of the embryo continues dividing on its own, ultimately developing into separate, complete individuals. Since they developed from the same fertilized egg, the resulting individuals are genetically identical.

- Artificial embryo twinning is low-tech unlike the natural development of identical twins from the embryo after fertilization
- Artificial embryo twinning is low-tech and is close to the natural development of twins where the embryo splits into two identical twins
- Artificial embryo twinning is low-tech and mimetic of the natural development of genetically identical twins from the embryo after fertilization
- Artificial embryo twinning is just like the natural development of twins, where during fertilization twins are formed

**DIRECTIONS for the question:** Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

26. 1. Translators are like bumblebees.  
 2. Though long since scientifically disproved, this factoid is still routinely trotted out.  
 3. Similar pronouncements about the impossibility of translation have dogged practitioners since Leonardo Bruni's *De interpretatione recta*, published in 1424.  
 4. Bees, unaware of these deliberations, have continued to flit from flower to flower, and translators continue to translate.  
 5. In 1934, the French entomologist August Magnan pronounced the flight of the bumblebee to be aerodynamically impossible

**DIRECTIONS for the question:** The four sentences (labelled 1,2,3 and 4) given in this question, when properly sequenced, form a coherent paragraph. Decide on the proper order for the sentence and key in this sequence of four numbers as your answer.

27. 1. The woodland's canopy receives most of the sunlight that falls on the trees.  
 2. Swifts do not confine themselves to woodlands, but hunt wherever there are insects in the air.  
 3. With their streamlined bodies, swifts are agile flyers, ideally adapted to twisting and turning through the air as they chase flying insects – the creatures that form their staple diet.

4. Hundreds of thousands of insects fly in the sunshine up above the canopy, some falling prey to swifts and swallows

**DIRECTIONS for the question:** Four of the five sentences (labelled 1,2,3,4 and 5) given in this question, when properly sequenced, form a coherent paragraph. Find the odd one out and key in your answer.

28. 1. In many cases time inconsistency is what prevents our going from intention to action.  
 2. For people to continuously postpone getting their children immunized, they would need to be constantly fooled by themselves.  
 3. In the specific case of immunization, however, it is hard to believe that time inconsistency by itself would be sufficient to make people permanently postpone the decision if they were fully cognizant of its benefits.  
 4. In most cases, even a small cost of immunization was large enough to discourage most people.  
 5. Not only do they have to think that they prefer to spend time going to the camp next month rather than today, they also have to believe that they will indeed go next month.

**DIRECTIONS for the question:** The four sentences (labelled 1,2,3 and 4) given in this question, when properly sequenced, form a coherent paragraph. Decide on the proper order for the sentence and key in this sequence of four numbers as your answer.

29. 1. The eventual diagnosis was skin cancer and after treatment all seemed well.  
 2. The viola player didn't know what it was; nor did her GP.  
 3. Then a routine scan showed it had come back and spread to her lungs.  
 4. It started with a lump on Cathy Perkins' index finger.

**DIRECTIONS for the question:** Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

30. 1. Displacement in Bengal is thus not very significant in view of its magnitude.  
 2. A factor of displacement in Bengal is the shifting course of the Ganges leading to erosion of river banks.  
 3. The nature of displacement in Bengal makes it an interesting case study.  
 4. Since displacement due to erosion is well spread over a long period of time, it remains invisible.  
 5. Rapid displacement would have helped sensitize the public to its human costs.
31. 1. Impartiality and objectivity are fiendishly difficult concepts that can cause all sorts of injustices even if transparently implemented.  
 2. It encourages us into bubbles of people we know and like, while blinding us to different perspectives, but the deeper problem of 'transparency' lies in the words "... and much more".  
 3. Twitter's website says that "tweets you are likely to care about most will show up first in your timeline...based on accounts you interact with most, tweets you engage with, and much more."

4. We are only told some of the basic principles, and we can't see the algorithm itself, making it hard for citizens to analyse the system sensibly or fairly or be convinced of its impartiality and objectivity.

**DIRECTIONS for the question:** *Identify the most appropriate summary for the paragraph.*

32. The conceptualization of landscape as a geometric object first occurred in Europe and is historically related to the European conceptualization of the organism, particularly the human body, as a geometric object with parts having a rational, three-dimensional organization and integration. The European idea of landscape appeared before the science of landscape emerged, and it is no coincidence that Renaissance artists such as Leonardo da Vinci, who studied the structure of the human body, also facilitated an understanding of the structure of landscape. Landscape which had been a subordinate background to religious or historical narratives, became an independent genre or subject of art by the end of sixteenth century or the beginning of the seventeenth century.
- The Renaissance artists were responsible for the study of landscape as a subject of art.
  - The study of landscape as an independent genre was aided by the Renaissance artists.
  - Landscape became a major subject of art at the turn of the sixteenth century.
  - The three-dimensional understanding of the organism in Europe led to a similar approach towards the understanding of landscape.

**DIRECTIONS for the question:** *The four sentences (labelled 1,2,3 and 4) given in this question, when properly sequenced, form a coherent paragraph. Decide on the proper order for the sentence and key in this sequence of four numbers as your answer.*

33. 1. But now we have another group: the unwitting enablers.  
 2. Democracy and high levels of inequality of the kind that have come to characterize the United States are simply incompatible.  
 3. Believing these people are working for a better world, they are, actually, at most, chipping away at the margins, making slight course corrections, ensuring the system goes on as it is, uninterrupted.  
 4. Very rich people will always use money to maintain their political and economic power.

**DIRECTIONS for the question:** *Identify the most appropriate summary for the paragraph and write the key for most appropriate option.*

34. Production and legitimation of scientific knowledge can be approached from a number of perspectives. To study knowledge production from the sociology of professions perspective would mean a focus on the institutionalization of a body of knowledge. The professions approach informed earlier research on managerial occupation, business schools and management knowledge. It however tends to reify institutional power structures in its understanding of the links between knowledge and authority. Knowledge production is restricted in the perspective to the selected members of the professional community, most notably to the university faculties and professional colleges.

Power is understood as a negative mechanism, which prevents the non-professional actors from offering their ideas and information as legitimate knowledge.

- Professions-approach aims at the institutionalization of knowledge but restricts knowledge production as a function of a select few.
- Professions-approach focuses on the creation of institutions of higher education and disciplines to promote knowledge production
- The study of knowledge production can be done through many perspectives
- The professions-approach has been one of the most relied upon perspective in the study of management knowledge production

## SECTION: DI & REASONING

**DIRECTIONS (Qs. 35-38) :** *Read the information given below and answer the question that follows.*

You are given an  $n \times n$  square matrix to be filled with numerals so that no two adjacent cells have the same numeral. Two cells are called adjacent if they touch each other horizontally, vertically or diagonally. So a cell in one of the four corners has three cells adjacent to it, and a cell in the first or last row or column which is not in the corner has five cells adjacent to it. Any other cell has eight cells adjacent to it.

- What is the minimum number of different numerals needed to fill a  $3 \times 3$  square matrix?
- What is the minimum number of different numerals needed to fill a  $5 \times 5$  square matrix?
- Suppose you are allowed to make one mistake, that is, one pair of adjacent cells can have the same numeral. What is the minimum number of different numerals required to fill a  $5 \times 5$  matrix?
 

(a) 9	(b) 25
(c) 4	(d) 16
- Suppose that all the cells adjacent to any particular cell must have different numerals. What is the minimum number of different numerals needed to fill a  $5 \times 5$  square matrix?
 

(a) 4	(b) 16
(c) 9	(d) 25

**DIRECTIONS (Qs. 39-42) :** *Go through the graph and the information given below and answer the question that follows.*

A company administers a written test comprising of three sections of 20 marks each – Data Interpretation (DI), Written English (WE) and General Awareness (GA), for recruitment. A composite score for a candidate (out of 80) is calculated by doubling her marks in DI and adding it to the sum of her marks in the other two sections. Candidates who score less than 70% marks in two or more sections are disqualified. From among the rest, the four with the highest composite scores are recruited. If four or less candidates qualify, all who qualify are recruited.

Then candidates appeared for the written test. Their marks in the test are given in the table below. Some marks in the table are missing, but the following facts are known:



- No two candidates had the same composite score.
- Ajay was the unique highest scorer in WE.
- Among the four recruited, Geeta had the lowest composite score.
- Indu was recruited.
- Danish, Harini, and Indu had scored the same marks in the GA.
- Indu and Jatin both scored 100% in exactly one section and Jatin's composite score was 10 more than Indu's.

Marks out of 20			
Candidate	DI	WE	GA
Ajay	8		16
Bala		9	11
Chetna	19	4	12
Danish	8	15	
Ester	12	18	16
Falak	15	7	10
Geeta	14		6
Harini	5		
Indu		8	
Jatin		16	14

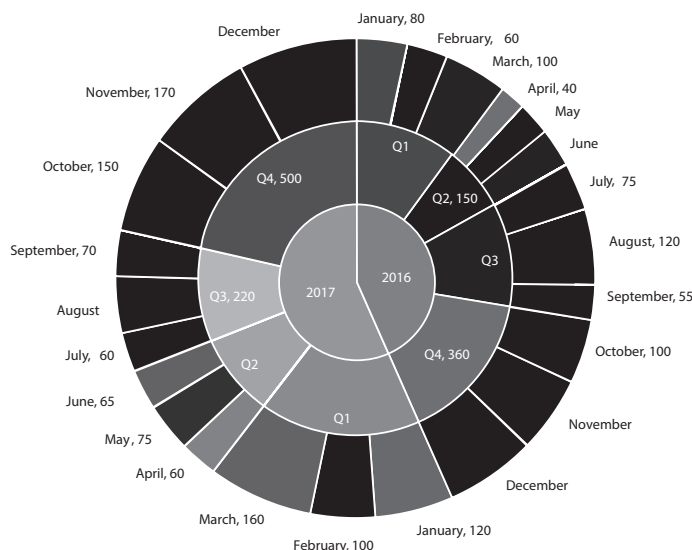
- Which of the following statements MUST be true?
  - Jatin's composite score was more than that of Danish.
  - Indu scored less than Chetna in DI.
  - Jatin scored more than Indu in GA.

(a) Both 1 and 2                      (b) Only 2  
(c) Both 2 and 3                      (d) Only 1
- Which of the following statements MUST be FALSE?
  - Harini's composite score was less than that of Falak
  - Bala's composite score was less than that of Ester
  - Chetna scored more than Bala in DI
  - Bala scored same as Jatin in DI
- If all the candidates except Ajay and Danish had different marks in DI, and Bala's composite score was less than Chetna's composite score, then what is the maximum marks that Bala could have scored in DI?
- If all the candidates scored different marks in WE then what is the maximum marks that Harini could have scored in WE?

**DIRECTIONS (Qs. 43-46) :** Go through the pie chart/s given below and answer the question that follows.

The multi-layered pie-chart below shows the sales of LED television sets for a big retail electronics outlet during 2016 and 2017. The outer layer shows the monthly sales during this period, with each label showing the month followed by sales figure of that month. For some months, the sales figures are not given in the chart. The middle-layer shows quarter-wise aggregate sales figures (in some cases, aggregate quarter-wise sales numbers are not given next to the quarter). The innermost layer shows annual sales. It is known that the sales figures during the three months of the second quarter (April, May, June) of 2016 form an arithmetic

progression, as do the three monthly sales figures in the fourth quarter (October, November, December) of that year.



- What is the percentage increase in sales in December 2017 as compared to the sales in December 2016?
 

(a) 50.00                      (b) 22.22  
(c) 38.46                      (d) 28.57
- In which quarter of 2017 was the percentage increase in sales from the same quarter of 2016 the highest?
 

(a) Q4                      (b) Q1  
(c) Q2                      (d) Q3
- During which quarter was the percentage decrease in sales from the previous quarter's sales the highest?
 

(a) Q2 of 2017                      (b) Q1 of 2017  
(c) Q2 of 2016                      (d) Q4 of 2017
- During which month was the percentage increase in sales from the previous month's sales the highest?
 

(a) October of 2017                      (b) March of 2017  
(c) March of 2016                      (d) October of 2016

**DIRECTIONS (Qs. 47-50) :** Read the information given below and answer the question that follows.

Fuel contamination levels at each of 20 petrol pumps  $P_1, P_2, \dots, P_{20}$  were recorded as either high, medium, or low.

- Contamination levels at three pumps among  $P_1 - P_5$  were recorded as high.
  - $P_6$  was the only pump among  $P_1 - P_{10}$  where the contamination level was recorded as low.
  - $P_7$  and  $P_8$  were the only two consecutively numbered pumps where the same levels of contamination were recorded.
  - High contamination levels were not recorded at any of the pumps  $P_{16} - P_{20}$ .
  - The number of pumps where high contamination levels were recorded was twice the number of pumps where low contamination levels were recorded.
- Which of the following MUST be true?
 

(a) The contamination level at  $P_{10}$  was recorded as high  
(b) The contamination level at  $P_{13}$  was recorded as low



- (c) The contamination level at  $P_{12}$  was recorded as high  
 (d) The contamination level at  $P_{20}$  was recorded as medium
48. What best can be said about the number of pumps at which the contamination levels were recorded as medium?  
 (a) More than 4 (b) At least 8  
 (c) At most 9 (d) Exactly 8
49. If the contamination level at  $P_{11}$  was recorded as low, then which of the following MUST be true?  
 (a) The contamination level at  $P_{15}$  was recorded as medium  
 (b) The contamination level at  $P_{18}$  was recorded as low  
 (c) The contamination level at  $P_{12}$  was recorded as high  
 (d) The contamination level at  $P_{14}$  was recorded as medium
50. If contamination level at  $P_{15}$  was recorded as medium, then which of the following MUST be FALSE?  
 (a) Contamination levels at  $P_{13}$  and  $P_{17}$  were recorded as the same  
 (b) Contamination levels at  $P_{11}$  and  $P_{16}$  were recorded as the same  
 (c) Contamination levels at  $P_{10}$  and  $P_{14}$  were recorded as the same  
 (d) Contamination level at  $P_{14}$  was recorded to be higher than that at  $P_{15}$

**DIRECTIONS (Qs. 51-54) :** Read the information given below and answer the question that follows.

1600 satellites were sent up by a country for several purposes. The purposes are classified as broadcasting (B), communication (C), surveillance (S), and others (O). A satellite can serve multiple purposes; however a satellite serving either B, or C, or S does not serve O. The following facts are known about the satellites:

- The numbers of satellites serving B, C, and S (though may be not exclusively) are in the ratio 2:1:1.
  - The number of satellites serving all three of B, C, and S is 100.
  - The number of satellites exclusively serving C is the same as the number of satellites exclusively serving S. This number is 30% of the number of satellites exclusively serving B.
  - The number of satellites serving O is the same as the number of satellites serving both C and S but not B.
51. What best can be said about the number of satellites serving C?  
 (a) Must be between 450 and 725  
 (b) Must be at least 100  
 (c) Cannot be more than 800  
 (d) Must be between 400 and 800
52. What is the minimum possible number of satellites serving B exclusively?  
 (a) 500 (b) 250  
 (c) 200 (d) 100
53. If at least 100 of the 1600 satellites were serving O, what can be said about the number of satellites serving S?  
 (a) Exactly 475  
 (b) No conclusion is possible based on the given information

- (c) At least 475  
 (d) At most 475

54. If the number of satellites serving at least two among B, C, and S is 1200, which of the following MUST be FALSE?  
 (a) The number of satellites serving B is more than 1000  
 (b) The number of satellites serving B exclusively is exactly 250  
 (c) All 1600 satellites serve B or C or S  
 (d) The number of satellites serving C cannot be uniquely determined

**DIRECTIONS (Qs. 55-58) :** Read the information given below and answer the question that follows.

An ATM dispenses exactly Rs. 5000 per withdrawal using 100, 200 and 500 rupee notes. The ATM requires every customer to give her preference for one of the three denominations of notes. It then dispenses notes such that the number of notes of the customer's preferred denomination exceeds the total number of notes of other denominations dispensed to her.

55. In how many different ways can the ATM serve a customer who gives 500 rupee notes as her preference?
56. If the ATM could serve only 10 customers with a stock of fifty 500 rupee notes and a sufficient number of notes of other denominations, what is the maximum number of customers among these 10 who could have given 500 rupee notes as their preferences?
57. What is the maximum number of customers that the ATM can serve with a stock of fifty 500 rupee notes and a sufficient number of notes of other denominations, if all the customers are to be served with at most 20 notes per withdrawal?  
 (a) 13 (b) 10  
 (c) 16 (d) 12
58. What is the number of 500 rupee notes required to serve 50 customers with 500 rupee notes as their preferences and another 50 customers with 100 rupee notes as their preferences, if the total number of notes to be dispensed is the smallest possible?  
 (a) 750 (b) 900  
 (c) 800 (d) 1400

**DIRECTIONS (Qs. 59-62) :** Read the information given below and answer the question that follows.

Twenty four people are part of three committees which are to look at research, teaching, and administration respectively. No two committees have any member in common. No two committees are of the same size. Each committee has three types of people: bureaucrats, educationalists, and politicians, with at least one from each of the three types in each committee. The following facts are also known about the committees:

- The numbers of bureaucrats in the research and teaching committees are equal, while the number of bureaucrats in the research committee is 75% of the number of bureaucrats in the administration committee.
- The number of educationalists in the teaching committee is less than the number of educationalists in the research

- committee. The number of educationalists in the research committee is the average of the numbers of educationalists in the other two committees.
3. 60% of the politicians are in the administration committee, and 20% are in the teaching committee.
59. Based on the given information, which of the following statements MUST be FALSE?
- The size of the research committee is less than the size of the teaching committee
  - The size of the research committee is less than the size of the administration committee
  - In the administration committee the number of bureaucrats is equal to the number of educationalists
  - In the teaching committee the number of educationalists is equal to the number of politicians
60. What is the number of bureaucrats in the administration committee?
61. What is the number of educationalists in the research committee?
62. Which of the following CANNOT be determined uniquely based on the given information?
- The total number of bureaucrats in the three committees
  - The size of the teaching committee
  - The total number of educationalists in the three committees
  - The size of the research committee

**DIRECTIONS (Qs. 63-66) :** Read the information given below and answer the question that follows.

Adriana, Bandita, Chitra, and Daisy are four female students, and Amit, Barun, Chetan, and Deb are four male students. Each of them studies in one of three institutes - X, Y, and Z. Each student majors in one subject among Marketing, Operations, and Finance, and minors in a different one among these three subjects. The following facts are known about the eight students:

- Three students are from X, three are from Y, and the remaining two students, both female, are from Z.
  - Both the male students from Y minor in Finance, while the female student from Y majors in Operations.
  - Only one male student majors in Operations, while three female students minor in Marketing.
  - One female and two male students major in Finance.
  - Adriana and Deb are from the same institute. Daisy and Amit are from the same institute.
  - Barun is from Y and majors in Operations. Chetan is from X and majors in Finance.
  - Daisy minors in Operations.
63. Who are the students from the institute Z?
- Chitra and Daisy
  - Adriana and Daisy
  - Bandita and Chitra
  - Adriana and Bandita
64. Which subject does Deb minor in?
- Finance
  - Marketing

- Cannot be determined uniquely from the given information
  - Operations
65. Which subject does Amit major in?
- Cannot be determined uniquely from the given information
  - Marketing
  - Finance
  - Operations
66. If Chitra majors in Finance, which subject does Bandita major in?
- Marketing
  - Cannot be determined uniquely from the given information
  - Finance
  - Operations

### SECTION : QUANTITATIVE ABILITY

**DIRECTIONS (Qs. 67-100) :** Solve the following questions and mark the best possible option.

67. Let  $x, y, z$  be three positive real numbers in a geometric progression such that  $x < y < z$ . If  $5x, 16y$ , and  $12z$  are in an arithmetic progression then the common ratio of the geometric progression is
- $1/6$
  - $3/2$
  - $5/2$
  - $3/6$
68. Humans and robots can both perform a job but at different efficiencies. Fifteen humans and five robots working together take thirty days to finish the job, whereas five humans and fifteen robots working together take sixty days to finish it. How many days will fifteen humans working together (without any robot) take to finish it?
- 45
  - 36
  - 40
  - 32
69. A tank is fitted with pipes, some filling it and the rest draining it. All filling pipes fill at the same rate, and all draining pipes drain at the same rate. The empty tank gets completely filled in 6 hours when 6 filling and 5 draining pipes are on, but this time becomes 60 hours when 5 filling and 6 draining pipes are on. In how many hours will the empty tank get completely filled when one draining and two filling pipes are on?
70. Points E, F, G, H lie on the sides AB, BC, CD, and DA, respectively, of a square ABCD. If EFGH is also a square whose area is 62.5% of that of ABCD and CG is longer than EB, then the ratio of length of EB to that of CG is
- 3 : 8
  - 2 : 5
  - 1 : 3
  - 4 : 9
71. Given an equilateral triangle  $T_1$  with side 24 cm, a second triangle  $T_2$  is formed by joining the midpoints of the sides of  $T_1$ . Then a third triangle  $T_3$  is formed by joining the midpoints of the sides of  $T_2$ . If this process of forming triangles is continued, the sum of the areas, in sq cm, of infinitely many such triangles  $T_1, T_2, T_3, \dots$  will be

- (a)  $248\sqrt{3}$  (b)  $192\sqrt{3}$   
 (c)  $188\sqrt{3}$  (d)  $1164\sqrt{3}$
72. If  $x$  is a positive quantity such that  $2^x = 3^{\log_2 2}$ , then  $x$  is equal to  
 (a)  $1 + \log_3 \frac{5}{3}$  (b)  $\log_3 9$   
 (c)  $\log_3 8$  (d)  $1 + \log_3 \frac{3}{5}$
73. A trader sells 10 litres of a mixture of paints A and B, where the amount of B in the mixture does not exceed that of A. The cost of paint A per litre is Rs. 8 more than that of paint B. If the trader sells the entire mixture for Rs. 264 and makes a profit of 10%, then the highest possible cost of paint B, in Rs. per litre, is  
 (a) 20 (b) 22  
 (c) 16 (d) 26
74. Raju and Lalitha originally had marbles in the ratio 4:9. Then Lalitha gave some of her marbles to Raju. As a result, the ratio of the number of marbles with Raju to that with Lalitha became 5:6. What fraction of her original number of marbles was given by Lalitha to Raju?  
 (a)  $\frac{6}{19}$  (b)  $\frac{7}{33}$   
 (c)  $\frac{1}{4}$  (d)  $\frac{1}{4}$
75. When they work alone, B needs 25% more time to finish a job than A does. They two finish the job in 13 days in the following manner: A works alone till half the job is done, then A and B work together for four days, and finally B works alone to complete the remaining 5% of the job. In how many days can B alone finish the entire job?  
 (a) 16 (b) 20  
 (c) 18 (d) 22
76. Two types of tea, A and B, are mixed and then sold at Rs. 40 per kg. The profit is 10% if A and B are mixed in the ratio 3 : 2, and 5% if this ratio is 2 : 3. The cost prices, per kg, of A and B are in the ratio.  
 (a) 17 : 25 (b) 21 : 25  
 (c) 18 : 25 (d) 19 : 24
77. In an apartment complex, the number of people aged 51 years and above is 30 and there are at most 39 people whose ages are below 51 years. The average age of all the people in the apartment complex is 38 years. What is the largest possible average age, in years, of the people whose ages are below 51 years?  
 (a) 26 (b) 27  
 (c) 28 (d) 25
78. In a circle with center O and radius 1 cm, an arc AB makes an angle 60 degrees at O. Let R be the region bounded by the radii OA, OB and the arc AB. If C and D are two points on OA and OB, respectively, such that OC = OD and the area of triangle OCD is half that of R, then the length of OC, in cm, is  
 (a)  $\left(\frac{\pi}{4}\right)^{\frac{1}{2}}$  (b)  $\left(\frac{\pi}{3\sqrt{3}}\right)^{\frac{1}{2}}$   
 (c)  $\left(\frac{\pi}{6}\right)^{\frac{1}{2}}$  (d)  $\left(\frac{\pi}{4\sqrt{3}}\right)^{\frac{1}{2}}$
79. The number of integers  $x$  such that  $0.25 < 2^x < 200$ , and  $2^x + 2$  is perfectly divisible by either 3 or 4, is
80. Let ABCD be a rectangle inscribed in a circle of radius 13 cm. Which one of the following pairs can represent, in cm, the possible length and breadth of ABCD?  
 (a) 25, 9 (b) 24, 12  
 (c) 24, 10 (d) 25, 10
81. In a parallelogram ABCD of area 72 sq cm, the sides CD and AD have lengths 9 cm and 16 cm, respectively. Let P be a point on CD such that AP is perpendicular to CD. Then the area, in sq cm, of triangle APD is  
 (a)  $32\sqrt{3}$  (b)  $18\sqrt{3}$   
 (c)  $24\sqrt{3}$  (d)  $12\sqrt{3}$
82. Given that  $X^{2018}Y^{2017} = 1/2$  and  $X^{2016}Y^{2019} = 8$ , the value of  $x^2 + y^3$  is  
 (a)  $33/4$  (b)  $37/4$   
 (c)  $35/4$  (d)  $31/4$
83. In an examination, the maximum possible score is N while the pass mark is 45% of N. A candidate obtains 36 marks, but falls short of the pass mark by 68%. Which one of the following is then correct?  
 (a)  $243 \leq N \leq 252$  (b)  $N \geq 253$   
 (c)  $201 \leq N \leq 242$  (d)  $N \leq 200$
84. Let  $f(x) = \min\{2x^2, 52-5x\}$ , where  $x$  is any positive real number. Then the maximum possible value of  $f(x)$  is
85. Point P lies between points A and B such that the length of BP is thrice that of AP. Car 1 starts from A and moves towards B. Simultaneously, car 2 starts from B and moves towards A. Car 2 reaches P one hour after car 1 reaches P. If the speed of car 2 is half that of car 1, then the time, in minutes, taken by car 1 in reaching P from A is
86. John borrowed Rs.2,10,000 from a bank at an interest rate of 10% per annum, compounded annually. The loan was repaid in two equal installments, the first after one year and the second after another year. The first installment was interest of one year plus part of the principal amount, while the second was the rest of the principal amount plus due interest thereon. Then each installment, in Rs., is
87. A CAT aspirant appears for a certain number of tests. His average score increases by 1 if the first 10 tests are not considered, and decreases by 1 if the last 10 tests are not considered. If his average scores for the first 10 and the last 10 tests are 20 and 30, respectively, then the total number of tests taken by him is
88. Train T leaves station X for station Y at 3 pm. Train S, traveling at three quarters of the speed of T, leaves Y for X at 4 pm. The two trains pass each other at a station Z, where the distance between X and Z is three-fifths of that between X and Y. How many hours does train T take for its journey from X to Y?

89. A right circular cone, of height 12 ft, stands on its base which has diameter 8 ft. The tip of the cone is cut off with a plane which is parallel to the base and 9 ft from the base. With  $\pi = 22/7$ , the volume, in cubic ft, of the remaining part of the cone is
90. If  $\log_{12} 18 = p$ , then  $3\left(\frac{4-p}{4+p}\right)$  is equal to  
 (a)  $\log_2 8$  (b)  $\log_4 16$   
 (c)  $\log_6 8$  (d)  $\log_6 16$
91. A wholesaler bought walnuts and peanuts, the price of walnut per kg being thrice that of peanut per kg. He then sold 8 kg of peanuts at a profit of 10% and 16 kg of walnuts at a profit of 20% to a shopkeeper. However, the shopkeeper lost 5 kg of walnuts and 3 kg of peanuts in transit. He then mixed the remaining nuts and sold the mixture at Rs. 166 per kg, thus making an overall profit of 25%. At what price, in Rs. per kg, did the wholesaler buy the walnuts?  
 (a) 86 (b) 96  
 (c) 84 (d) 98
92. If  $f(x+2) = f(x) + f(x+1)$  for all positive integers  $x$ , and  $f(11) = 91$ ,  $f(15) = 617$ , then  $f(10)$  equals
93. While multiplying three real numbers, Ashok took one of the numbers as 73 instead of 37. As a result, the product went up by 720. Then the minimum possible value of the sum of squares of the other two numbers is
94. The distance from A to B is 60 km. Partha and Narayan start from A at the same time and move towards B. Partha takes four hours more than Narayan to reach B. Moreover, Partha reaches the mid-point of A and B two hours before Narayan reaches B. The speed of Partha, in km per hour, is  
 (a) 5 (b) 6  
 (c) 4 (d) 3
95. In a circle, two parallel chords on the same side of a diameter have lengths 4 cm and 6 cm. If the distance between these chords is 1 cm, then the radius of the circle, in cm, is  
 (a)  $\sqrt{13}$  (b)  $\sqrt{14}$   
 (c)  $\sqrt{11}$  (d)  $\sqrt{12}$
96. If among 200 students, 105 like pizza and 134 like burger, then the number of students who like only burger can possibly be  
 (a) 93 (b) 26  
 (c) 96 (d) 23
97. How many numbers with two or more digits can be formed with the digits 1,2,3,4,5,6,7,8,9, so that in every such number, each digit is used at most once and the digits appear in the ascending order?
98. If  $u^2 + (u-2v-1)^2 = -4v(u+v)$ , then what is the value of  $u+3v$ ?  
 (a) 0 (b)  $-1/4$   
 (c)  $1/4$  (d)  $1/2$
99. If  $\log_2(5 + \log_3 a) = 3$  and  $\log_5(4a + 12 + \log_2 b) = 3$ , then  $a+b$  is equal to  
 (a) 40 (b) 67  
 (c) 59 (d) 32
100. Each of 74 students in a class studies at least one of the three subjects H, E and P. Ten students study all three subjects, while twenty study H and E, but not P. Every student who studies P also studies H or E or both. If the number of students studying H equals that studying E, then the number of students studying H is