

CAT 2018

SHIFT-1

QUESTION
PAPER

Time: 180 Mins

Total Marks: 300

Important Instructions

- (i) Total Number of Questions: 100
- (ii) Number of Questions in Verbal Ability and Reading Comprehension (VARC): 34
- (iii) Number of Questions in Data Interpretation and Logical Reasoning (DILR): 32
- (iv) Number of Questions in Quantitative Ability (QA): 34
- (v) 60 minutes are allotted to attempt each section.
- (vi) 4 answer options for each MCQ type question.
- (vii) Answers are typed in the given space on the computer screen for Non-MCQ.
- (viii) For each correct answer: + 3 marks
- (ix) Negative marking (Applicable for wrong answers in MCQs): - 1 mark

Verbal Ability and Reading Comprehension (VARC)

Directions (Q. 1 to 5): Read the passage carefully and answer the questions given:

... "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], has 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."

Q.1. Which of the following statements best expresses the overall argument of this passage?

- (1) The brain organisation and early development of elephants and humans are extremely similar.
- (2) Recent elephant behaviour could be understood as a form of species-wide trauma related response.
- (3) The relationship between elephants and humans has changed from one of coexistence to one of hostility.
- (4) Elephants, like the humans they are in conflict with, are profoundly social creatures.

Q.2. In paragraph 4, the phrase, "The fabric of elephant society . . . has[s] effectively been frayed by . . ." is:

- (1) an accurate description of the condition of elephant herds today.
- (2) a metaphor for the effect of human activity on elephant communities.
- (3) an exaggeration aimed at bolstering Bradshaw's claims.
- (4) an ode to the fragility of elephant society today.

Q.3. The passage makes all of the following claims EXCEPT:

- (1) elephants establish extended and enduring familial relationships as do humans.
- (2) human actions such as poaching and culling have created stressful conditions for elephant communities.

- (3) the elephant response to deeply disturbing experiences is similar to that of humans.
- (4) elephant mothers are evolving newer ways of rearing their calves to adapt to emerging threats.

Q.4. In the first paragraph, Bradshaw uses the term "violence" to describe the recent change in the human elephant relationship because, according to him:

- (1) both humans and elephants have killed members of each other's species.
- (2) there is a purposefulness in human and elephant aggression towards each other.
- (3) human-elephant interactions have changed their character over time.
- (4) elephant herds and their habitat have been systematically destroyed by humans.

Q.5. Which of the following measures is Bradshaw most likely to support to address the problem of elephant aggression?

- (1) The development of treatment programmes for elephants drawing on insights gained from treating post-traumatic stress disorder in humans.
- (2) Increased funding for research into the similarity of humans and other animals drawing on insights gained from human-elephant similarities.
- (3) Studying the impact of isolating elephant calves on their early brain development, behaviour and aggression.
- (4) Funding of more studies to better understand the impact of testosterone on male elephant aggression.

Directions (Q. 6 to 10): Read the following passage and answer the questions that follow:

[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. . . . Many 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.

Q. 6. The author suggests that a major reason why India has not so far acknowledged its role in the Second World War is that it:

- (1) wants to forget the human and financial toll of the war on the country.
- (2) has been focused on building an independent, non-colonial political identity.
- (3) views the war as a predominantly Allied effort, with India playing only a supporting role.
- (4) blames the war for leading to the momentous partition of the country.

Q. 7. The phrase "mood music" is used in the second paragraph to indicate that the Second World War is viewed as:

- (1) setting the stage for the emergence of the India-Pakistan rivalry in the subcontinent.

- (2) a part of the narrative on the ill-effects of colonial rule on India.

- (3) a tragic period in terms of loss of lives and national wealth.

- (4) a backdrop to the subsequent independence and partition of the region.

Q. 8. The author lists all of the following as outcomes of the Second World War EXCEPT:

- (1) US recognition of India's strategic location and role in the war.

- (2) the large financial debt India owed to Britain after the war.

- (3) large-scale deaths in Bengal as a result of deprivation and famine.

- (4) independence of the subcontinent and its partition into two countries.

Q. 9. The author claims that omitting mention of Indians who served in the Second World

War from the new National War Memorial is:

- (1) is something which can be rectified in future by constructing a separate memorial.
- (2) a reflection of misplaced priorities of the post-independence Indian governments.
- (3) appropriate as their names can always be included in the India Gate memorial.
- (4) a reflection of the academic and popular view of India's role in the war.

Q. 10. In the first paragraph, the author laments the fact that:

- (1) the new war memorial will be built right next to India Gate.
- (2) there is no recognition of the Indian soldiers who served in the Second World War.
- (3) India lost thousands of human lives during the Second World War.
- (4) funds will be wasted on another War Memorial when we already have the India Gate memorial.

Directions (Q. 11 to 15): Read the following passage and answer the questions that follow:

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 to 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 greenwashing 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. . . . The 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.

Q. 11. It can be inferred that the author considers the Keep America Beautiful organisation:

- (1) an innovative example of a collaborative corporate social responsibility initiative.

- (2) a sham as it diverted attention away from the role of corporates in plastics pollution.
- (3) an important step in sensitising producers to the need to tackle plastics pollution.

- (4) a “greenwash” because it was a benevolent attempt to improve public recycling habits.

Q. 12. Which of the following interventions would the author most strongly support:

- (1) having all consumers change their plastic consumption habits.
- (2) recycling all plastic debris in the seabed.
- (3) passing regulations targeted at producers that generate plastic products.
- (4) completely banning all single-use plastic bags.

Q. 13. The author lists all of the following as negative effects of the use of plastics EXCEPT the:

- (1) air pollution caused during the process of recycling plastics.
- (2) poisonous chemicals released into the water and food we consume.
- (3) adverse impacts on the digestive systems of animals exposed to plastic.
- (4) slow pace of degradation or non-degradation of plastics in the environment.

Q. 14. In the second paragraph, the phrase “what hammering a nail is to halting a falling skyscraper” means:

- (1) focusing on single-use plastic bags to reduce the plastics footprint.
- (2) encouraging the responsible production of plastics by firms.
- (3) relying on emerging technologies to mitigate the ill-effects of plastic pollution.
- (4) focusing on consumer behaviour to tackle the problem of plastics pollution.

Q. 15. In the first paragraph, the author uses “lie” to refer to the:

- (1) understatement of the effects of recycling plastics.
- (2) understatement of the enormity of the plastics pollution problem.
- (3) blame assigned to consumers for indiscriminate use of plastics.
- (4) fact that people do not know they have been lied to.

Directions (Q. 16 to 20): Read the following passage and answer the questions that follow:

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.

Q. 16. From the passage we can infer that the author would like economists to:

- (1) work closely with neuroscientists to understand human behaviour.
- (2) incorporate psychological findings into their research cautiously.
- (3) correlate measurements of happiness with economic indicators.
- (4) measure the effectiveness of Facebook and social media advertising.

Q. 17. According to the author, wearable technologies and social media are contributing most to:

- (1) making individuals aware of stress in their lives.
- (2) depression as a thing of the past.
- (3) disciplining individuals to be happy.
- (4) happiness as a "personal project".

Q. 18. In the author's opinion, the shift in thinking in the 1970s:

- (1) put people in touch with their own feelings rather than depending on psychologists.
- (2) was a welcome change from the earlier view that depression could be cured by changing circumstances.

(3) introduced greater stress into people's lives as they were expected to be responsible for their own happiness.

(4) reflected the emergence of neuroscience as the authority on human emotions.

Q. 19. The author's view would be undermined by which of the following research findings?

(1) Stakeholders globally are moving away from collecting data on the well-being of individuals.

(2) There is a definitive move towards the adoption of wearable technology that taps into emotions.

(3) A proliferation of gyms that are collecting data on customer well-being.

(4) Individuals worldwide are utilising technologies to monitor and increase their well-being.

Q. 20. According to the author, Dubai:

(1) collaborates with Facebook to selectively influence its inhabitants' moods.

(2) develops sophisticated technologies to monitor its inhabitants' states of mind.

(3) is on its way to becoming one of the world's happiest cities.

(4) incentivises companies that prioritise worker welfare.

Directions (Q. 21 to 25): Read the following passage and answer the questions that follow:

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 extra-genetic 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.

Q. 21. The passage uses the metaphor of a dog walker to argue that evolutionary adaptation is most comprehensively understood as being determined by:

- (1) ecological, hormonal, extra genetic and genetic legacies.
- (2) genetic, epigenetic, developmental factors, and ecological legacies.
- (3) extra genetic, genetic, epigenetic and genomic legacies.
- (4) socio-cultural, genetic, epigenetic, and genomic legacies.

Q. 22. Which of the following options best describes the author's argument?

- (1) Wilson's theory of evolution is scientifically superior to either Darwin's or Mendel's.
- (2) Darwin's theory of natural selection cannot fully explain evolution.
- (3) Darwin's and Mendel's theories together best explain evolution.
- (4) Mendel's theory of inheritance is unfairly underestimated in explaining evolution.

Q. 23. The Emory University experiment with mice points to the inheritance of:

- (1) acquired parental fears

- (2) acquired characteristics
- (3) psychological markers
- (4) personality traits

Q. 24. Which of the following, if found to be true, would negate the main message of the passage?

- (1) A study affirming the sole influence of natural selection and inheritance on evolution.
- (2) A study highlighting the criticality of epigenetic inheritance to evolution.
- (3) A study indicating the primacy of ecological impact on human adaptation.
- (4) A study affirming the influence of socio-cultural markers on evolutionary processes.

Q. 25. The passage given below is followed by four summaries. Choose the option that best captures the author's position.

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.

- (1) Artificial embryo twinning is low-tech and mimetic of the natural development of genetically identical twins from the embryo after fertilization.

Directions (Q. 26 to 34): The passage given below is followed by four summaries. Choose the option that best captures the author's position.

Q. 26. 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.

- (1) Artificial embryo twinning is low-tech and mimetic of the natural development of genetically identical twins from the embryo after fertilization.
- (2) Artificial embryo twinning is low-tech and is close to the natural development of twins where the embryo splits into two identical twins.
- (3) Artificial embryo twinning is low-tech unlike the natural development of identical twins from the embryo after fertilization.
- (4) Artificial embryo twinning is just like the natural development of twins, where during fertilization twins are formed.

Q. 27. 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

- (2) Artificial embryo twinning is low-tech and is close to the natural development of twins where the embryo splits into two identical twins.
- (3) Artificial embryo twinning is low-tech unlike the natural development of identical twins from the embryo after fertilization.
- (4) Artificial embryo twinning is just like the natural development of twins, where during fertilization twins are formed.

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.

- (1) The three-dimensional understanding of the organism in Europe led to a similar approach towards the understanding of landscape.
- (2) Landscape became a major subject of art at the turn of the sixteenth century.
- (3) The study of landscape as an independent genre was aided by the Renaissance artists.
- (4) The Renaissance artists were responsible for the study of landscape as a subject of art.

Q. 28. The four sentences (labelled 1, 2, 3, 4) given in this question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper sequence of order of the sentences and key in this sequence of four numbers as your answer.

- (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.

Q. 29. The four sentences (labelled 1, 2, 3, 4) given in this question, when properly sequenced, form a coherent paragraph. Decide on the proper order for the sentences and key in this sequence of four numbers as your answer.

- (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.

Q. 30. The four sentences (labelled 1, 2, 3, 4) given in this question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper sequence of order of the sentences and key in this sequence of four numbers as your answer.

- (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.

Q. 31. The four sentences (labelled 1, 2, 3, 4) given in this question, when properly sequenced, form a coherent paragraph. Decide on the proper order for the sentences and key in this sequence of four numbers as your answer.

- (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.

Q. 32. 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.

- (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.

Q. 33. 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.

- (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.

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.

- (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.

Data Interpretation and Logical Reasoning (DILR)

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

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.

Q. 1. What best can be said about the number of satellites serving C?

- (1) Must be at least 100
 (2) Cannot be more than 800
 (3) Must be between 450 and 725
 (4) Must be between 400 and 800

Q. 2. What is the minimum possible number of satellites serving B exclusively?

- (1) 250 (2) 100
 (3) 500 (4) 200

Q. 3. If at least 100 of the 1600 satellites were serving O, what can be said about the number of satellites serving S?

- (1) At most 475

(2) Exactly 475

- (3) No conclusion is possible based on the given information
 (4) At least 475

Q. 4. If the number of satellites serving at least two among B, C, and S is 1200, which of the following MUST be FALSE?

- (1) The number of satellites serving B exclusively is exactly 250
 (2) The number of satellites serving B is more than 1000
 (3) The number of satellites serving C cannot be uniquely determined
 (4) All 1600 satellites serve B or C or S

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

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.

2. 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.
- Q. 5. Based on the given information, which of the following statement MUST be FALSE?**
- (1) In the teaching committee the number of educationalists is equal to the number of politicians
 - (2) In the administration committee the number of bureaucrats is equal to the number of educationalists
 - (3) The size of the research committee is less than the size of the teaching committee
 - (4) The size of the research committee is less than the size of the administration committee
- Q. 6. What is the number of bureaucrats in the administration committee?**
- Q. 7. What is the number of educationalists in the research committee?**
- Q. 8. Which of the following CANNOT be determined uniquely based on the given information?**
- (1) The size of the teaching committee
 - (2) The size of the research committee
 - (3) The total number of bureaucrats in the three committees
 - (4) The total number of educationalists in the three committees

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

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.

Ten 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:

1. No two candidates had the same composite score.
2. Ajay was the unique highest scorer in WE.
3. Among the four recruited, Geeta had the lowest composite score.
4. Indu was recruited.
5. Danish, Harini, and Indu had scored the same marks the in GA.
6. Indu and Jatin both scored 100% in exactly one section and Jatin's composite score was 10 more than Indu's.

Candidate	Marks out of 20		
	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

- Q. 9. Which of the following statements MUST be true?**
1. Jatin's composite score was more than that of Danish.
 2. Indu scored less than Chetna in DI.
 3. Jatin scored more than Indu in GA.
- (1) Both 2 and 3 (2) Only 1
(3) Only 2 (4) Both 1 and 2
- Q. 10. Which of the following statements MUST be FALSE?**
- (1) Bala scored same as Jatin in DI
 - (2) Harini's composite score was less than that of Falak

- (3) Bala's composite score was less than that of Ester
- (4) Chetna scored more than Bala in DI

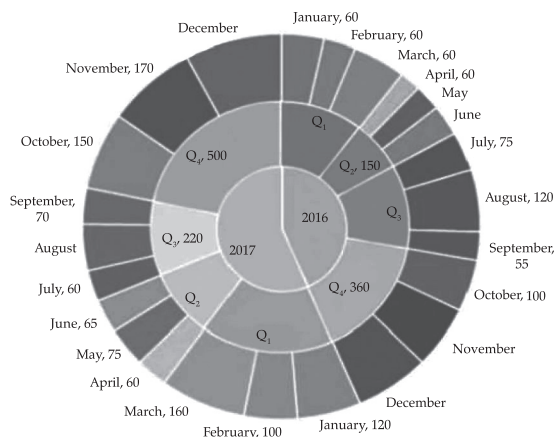
Q. 11. If all the candidates except Ajay and Danish had different marks in DI, and Bala's

composite score was less than Chetna's composite score, then what is the maximum marks that Bala could have scored in DI?

Q. 12. If all the candidates scored different marks in WE then what is the maximum marks that Harini could have scored in WE?

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

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.



Q. 13. What is the percentage increase in sales in December 2017 as compared to the sales in December 2016?
 (1) 38.46 (2) 22.22

- (3) 28.57 (4) 50.00

Q. 14. In which quarter of 2017 was the percentage increase in sales from the same quarter of 2016 the highest?

- (1) Q₂ (2) Q₁
- (3) Q₄ (4) Q₃

Q. 15. During which quarter was the percentage decrease in sales from the previous quarter's sales the highest?

- (1) Q₂ of 2017 (2) Q₄ of 2017
- (3) Q₂ of 2016 (4) Q₁ of 2017

Q. 16. During which month was the percentage increase in sales from the previous month's sales the highest?

- (1) March of 2017 (2) October of 2017
- (3) March of 2016 (4) October of 2016

Directions (Q. 17 to 20): Read the following passage carefully and answer the questions that follow.

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.

Q. 17. What is the minimum number of different numerals needed to fill a 3×3 square matrix?

- (1) 4 (2) 16
- (3) 9 (4) 25

Q. 18. What is the minimum number of different numerals needed to fill a 5×5 square matrix?

Q. 20. 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 5×5 square matrix?

- (1) 25 (2) 4
- (3) 16 (4) 9

Q. 19. 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 5×5 matrix?

Directions (Q. 21 to 24): Read the following passage carefully and answer the questions that follow.

An ATM dispenses exactly ₹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.

- Q. 21.** In how many different ways can the ATM serve a customer who gives 500 rupee notes as her preference?
Q. 22. 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?
Q. 23. 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?
 (1) 12 (2) 10
 (3) 13 (4) 16
Q. 24. 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?
 (1) 900 (2) 800
 (3) 750 (4) 1400

Directions (Q. 25 to 28): Read the following passage carefully and answer the questions that follow.

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:

1. Three students are from X, three are from Y, and the remaining two students, both female, are from Z.
 2. Both the male students from Y minor in Finance, while the female student from Y majors in Operations.
 3. Only one male student majors in Operations, while three female students minor in Marketing.
 4. One female and two male students major in Finance.
 5. Adriana and Deb are from the same institute. Daisy and Amit are from the same institute.
 6. Barun is from Y and majors in Operations. Chetan is from X and majors in Finance.
 7. Daisy minors in Operations.
- Q. 25.** Who are the students from the institute Z?
 (1) Chitra and Daisy
 (2) Adriana and Bandita
 (3) Bandita and Chitra
 (4) Adriana and Daisy
- Q. 26.** Which subject does Deb minor in?
 (1) Operations
 (2) Finance
 (3) Marketing
 (4) Cannot be determined uniquely from the given information
- Q. 27.** Which subject does Amit major in?
 (1) Marketing
 (2) Operations
 (3) Cannot be determined uniquely from the given information
 (4) Finance
- Q. 28.** If Chitra majors in Finance, which subject does Bandita major in?
 (1) Finance
 (2) Cannot be determined uniquely from the given information
 (3) Operations
 (4) Marketing

Directions (Q. 29 to 32): Read the following passage carefully and answer the questions that follow.

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.

Q. 29. Which of the following MUST be true?

- The contamination level at P_{20} was recorded as medium.
- The contamination level at P_{13} was recorded as low.
- The contamination level at P_{12} was recorded as high.
- The contamination level at P_{10} was recorded as high.

Q. 30. If the contamination level at P_{11} was recorded as low, then which of the following MUST be true?

- The contamination level at P_{12} was recorded as high.
- The contamination level at P_{15} was recorded as medium.
- The contamination level at P_{18} was recorded as low.

- The contamination level at P_{14} was recorded as medium.

Q. 31. What best can be said about the number of pumps at which the contamination levels were recorded as medium?

- At least 8
- More than 4
- Exactly 8
- At most 9

Q. 32. If contamination level at P_{15} was recorded as medium, then which of the following MUST be FALSE?

- Contamination levels at P_{13} and P_{17} were recorded as the same.
- Contamination levels at P_{11} and P_{16} were recorded as the same.
- Contamination level at P_{14} was recorded to be higher than that at P_{15} .
- Contamination levels at P_{10} and P_{14} were recorded as the same.

Quantitative Aptitude (QA)

Q. 1. On a long stretch of east-west road, A and B are two points such that B is 350 km west of A. One car starts from A and another from B at the same time. If they move towards each other, then they meet after 1 hour. If they both move towards east, then they meet in 7 hrs. The difference between their speeds, in km per hour, is

Q. 2. 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

Q. 3. John borrowed ₹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 ₹, is

Q. 4. 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?

- Q. 5. 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
- Q. 6. 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?
- (1) 27 (2) 25
(3) 26 (4) 28
- Q. 7. 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?
- (1) $N \leq 200$. (2) $243 \leq N \leq 252$.
(3) $201 \leq N \leq 242$. (4) $N \geq 253$
- Q. 8. 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 ₹166 per kg, thus making an overall profit of 25%. At what price, in ₹ per kg, did the wholesaler buy the walnuts?
- (1) 96 (2) 98
(3) 86 (4) 84
- Q. 9. Two types of tea, A and B, are mixed and then sold at ₹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
- (1) 17 : 25 (2) 18 : 25
(3) 19 : 24 (4) 21 : 25
- Q. 10. 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?
- (1) 45 (2) 36
(3) 32 (4) 40
- Q. 11. 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?
- (1) $\frac{1}{5}$ (2) $\frac{6}{19}$
(3) $\frac{1}{4}$ (4) $\frac{7}{33}$
- Q. 12. 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?
- (1) 20 (2) 22
(3) 16 (4) 18
- Q. 13. 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 ₹8 more than that of paint B. If the trader sells the entire mixture for ₹264 and makes a profit of 10%, then the highest possible cost of paint B, in ₹ per litre, is
- (1) 16 (2) 26
(3) 20 (4) 22
- Q. 14. 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
- (1) 6 (2) 4
(3) 3 (4) 5
- Q. 15. 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

- (1) 3 : 8 (2) 2 : 5
 (3) 4 : 9 (4) 1 : 3

Q. 16. 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

- (1) $\sqrt{13}$ (2) $\sqrt{14}$
 (3) $\sqrt{11}$ (4) $\sqrt{12}$

Q. 17. 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

- (1) $\left(\frac{\pi}{4\sqrt{3}}\right)^{\frac{1}{2}}$ (2) $\left(\frac{\pi}{6}\right)^{\frac{1}{2}}$
 (3) $\left(\frac{\pi}{3\sqrt{3}}\right)^{\frac{1}{2}}$ (4) $\left(\frac{\pi}{4}\right)^{\frac{1}{2}}$

Q. 18. 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

- (1) $32\sqrt{3}$ (2) $18\sqrt{3}$
 (3) $24\sqrt{3}$ (4) $12\sqrt{3}$

Q. 19. 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?

- (1) 24, 10 (2) 25, 9
 (3) 25, 10 (4) 24, 12

Q. 20. 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 $\pi = \frac{22}{7}$, the volume, in cubic ft, of the remaining part of the cone is

Q. 21. Given that $x^{2018} y^{2017} = \frac{1}{2}$, and $x^{2016} y^{2019} = 8$,

then value of $x^2 + y^3$ is:

- (1) $\frac{31}{4}$ (2) $\frac{35}{4}$
 (3) $\frac{37}{4}$ (4) $\frac{33}{4}$

Q. 22. If x is a positive quantity such that $2^x = 3^{\log_5 2}$ then x is equal to:

- (1) $\log_8 8$ (2) $1 + \log_3 \left(\frac{5}{3}\right)$
 (3) $\log_5 9$ (4) $1 + \log_5 \left(\frac{3}{5}\right)$

Q. 23. If $\log_{12} 81 = p$, then $3^{\left(\frac{4-p}{4+p}\right)}$ is equal to:

- (1) $\log_4 16$ (2) $\log_6 16$
 (3) $\log_2 8$ (4) $\log_6 8$

Q. 24. If $\log_2 (5 + \log_3 a) = 3$ and $\log_5 (4a + 12 + \log_2 b) = 3$, then $a + b$ is equal to:

- (1) 59 (2) 40
 (3) 32 (4) 67

Q. 25. If $U^2 + (U - 2V - 1)^2 = -4V(U + V)$, then what is the value of $U + 3V$?

- (1) 0 (2) $\frac{1}{2}$
 (3) $-\frac{1}{4}$ (4) $\frac{1}{4}$

Q. 26. 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

Q. 27. The number of integers x such that $0.25 \leq 2^x \leq 200$ and $2^x + 2$ is perfectly divisible by either 3 or 4, is

Q. 28. 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

Q. 29. 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?

Q. 30. Let $f(x) = \min (2x^2, 52 - 5x)$ where x is any positive real number. Then the maximum possible value of $f(x)$ is

Q. 31. 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:

Q. 32. 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

- (1) $188\sqrt{3}$ (2) $248\sqrt{3}$
 (3) $164\sqrt{3}$ (4) $192\sqrt{3}$

Q. 33. If among 200 students, 105 like pizza and 134 like burger, then the number of students

who like only burger can possibly be :

- (1) 23 (2) 26
 (3) 96 (4) 93

Q. 34. 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) $\frac{3}{6}$ (2) $\frac{1}{6}$
 (3) $\frac{5}{2}$ (4) $\frac{3}{2}$

Answer Key

Verbal Ability and Reading Comprehension (VARC)

1. (2)	2. (2)	3. (4)	4. (2)	5. (1)	6. (2)	7. (4)	8. (2)
9. (4)	10. (2)	11. (2)	12. (3)	13. (1)	14. (4)	15. (3)	16. (2)
17. (3)	18. (3)	19. (1)	20. (2)	21. (2)	22. (2)	23. (2)	24. (1)
25. (1)	26. (1)	27. (3)	28. 1324	29. 1432	30. 2413	31. 4213	32. (5)
33. (4)	34. (2)						

Data Interpretation and Logical Reasoning (DILR)

1. (3)	2. (1)	3. (1)	4. (3)	5. (3)	6. 4	7. 3	8. (1)
9. (4)	10. (1)	11. 13	12. 14	13. (3)	14. (2)	15. (1)	16. (2)
17. 4	18. 25	19. (4)	20. (4)	21. 7	22. 6	23. (1)	24. (1)
25. (3)	26. (2)	27. (4)	28. (3)	29. (4)	30. (3)	31. (4)	31. (2)

Quantitative Aptitude (QA)

1. 50	2. 12	3. 121000	4. 10	5. 60	6. (4)	7. (2)	8. (1)
9. (3)	10. (3)	11. (4)	12. (1)	13. (3)	14. (4)	15. (4)	16. (1)
17. (3)	18. (1)	19. (1)	20. 198	21. (4)	22. (4)	23. (4)	24. (1)
25. (3)	26. 54	27. 5	28. 40	29. 502	30. 32	31. 52	32. (4)
33. (4)	34. (3)						

Answers and Explanations

Verbal Ability and Reading Comprehension (VARC)

- Option (2) is correct.**

Though all the given options are close, option (2) best sums up the main idea of the passage. The entire passage revolves around the reasons the researcher figured out for the aggressive behavior of elephants. Rest of the options are used to support this main argument of the passage.
- Option (2) is correct.**

A metaphor, a figure of speech used to explain an idea by equating it to something else without using 'like' or 'as'. Here, the elephant society is compared to a fabric, which is being frayed by human activity.
- Option (4) is correct.**

Option (1) is eliminated. 'Young elephants are raised within an extended, multi-tiered 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'. From these lines option (1) can be inferred.

'This fabric of elephant society, Bradshaw and her colleagues demonstrate, has effectively been frayed by years of habitat loss and poaching, along with systematic culling by government agencies'. This line supports option (2).

Option (3) is ruled out. 'Elephants are suffering and behaving in the same ways that we recognize in ourselves as a result of violence ...' From this line option (3) can be inferred.

Option (4) is not hinted or given in the passage.
- Option (2) is correct.**

This is a direct question. In the first paragraph it is clearly stated: 'I use the term violence because of the intentionality associated with it...' The author emphasizes that the actions of the elephants on humans are deliberate just like those of humans on elephants. This is simply paraphrased in option (2).
- Option (1) is correct.**

Option (2) and (3) focus upon study, but they do not provide a solution to the problem of elephant aggression.

Option (4) is ruled out. Bradshaw does not believe testosterone is the reason for elephant aggression.

Option (1) offers a possible solution. Because the passage draws similarity between humans and elephants. "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 a social behavior, inattentive mothering and hyper-aggression." So, to address the problem of elephant aggression, Bradshaw is likely to support a measure that helps reduce or overcome this stress.
- Option (2) is correct.**

The line, 'fresh stories for self-legitimization rather than focusing on shared wartime experiences', can be translated as the country has been focused on building an independent, non-colonial political identity.
- Option (4) is correct.**

Two options, option (2) and option (3) can be easily eliminated, as they are not mentioned in the paragraph where 'mood music' is mentioned.

Out of option (1) and option (4), option (1) is distortion of the facts given in the passage. It says the war led to the rivalry, but this is not supported by the passage. Option (4) aptly hints that war is seen as nothing more than a background score/backdrop that sets the mood in the drama leading to independence and partition.

8. Option (2) is correct.

Option (1) is mentioned in the fourth paragraph. "This led the United States to take considerable interest in the country's future". We can infer that India's strategic location led to US's interests towards India." Hence, option (1) is ruled out.

Option (3) is stated in the sixth paragraph. Such extraordinary mobilization for war was achieved at great human cost, with the Bengal famine..." Hence, option (3) is eliminated.

Option (4) is ruled out because it is mentioned in the third paragraph, "The Second World War played a crucial role in both the independence and partition of India."

Option (2) is contrary to the fact mentioned in the passage. The passage states: India finished the war as one of the largest creditors' to Britain in the second world war." Hence, option (2) is the correct answer.

9. Option (4) is correct.

"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,". From this line option (4) can be derived. Hence, option (4) is the correct answer.

10. Option (2) is correct.

It is an easy question. The paragraph asserts that India has not yet come in terms with its contribution to second world war. From the lines: 'India's contribution to the second world war is airbrushed out of existence.', it is clear that the author regrets that there is still no recognition to the soldiers, who lost their lives in the second world war.

11. Option (2) is correct.

From the last line of the penultimate paragraph, it is clear that Keep America Beautiful was a clever misdirection. And it shift the onus of environmental responsibility onto the public while simultaneously becoming a trusted name in the environmental movement. . . . Means the author wants to say that the sole purpose of Keep America Beautiful was to shift the blame on the consumers. Hence, option (2) is the correct answer.

12. Option (3) is correct.

The passage asserts that individuals are not responsible for plastic pollution as is being said, but the responsibility lies on the producers of single-use plastic and *permissive legal framework* that has not put the onus on producers of plastic to manage waste. So, the author is most likely to support the regulations to make plastic producers sensible towards their duty related to environment.

Option (2) is clearly wrong, because it is contrary to the idea of the passage.

Option (1) is eliminated. The passage says that individuals are not responsible for the plastic pollution and changing their habit is not going to solve this problem.

Till the last paragraph the author suggests sensible use of plastic. So, he will not suggest complete ban on plastic.

13. Option (1) is correct.

Air pollution is neither discussed nor hinted in the passage. Rest all the negative impacts are mentioned in the 3rd paragraph. So, rest of the options are outrightly eliminated.

14. Option (4) is correct.

The second paragraph reinforces the idea of the first paragraph that consumers are not responsible for plastic pollution and changing consumers' habit of using plastic will not tackle this problem by comparing consumers recycling plastic to save the Earth to 'hammering a nail is to halting a falling skyscraper'.

15. Option (3) is correct.

The last line of the first paragraph makes it clear that the lie is the consumers are responsible for plastic pollution and changing consumers' habit of using plastic will tackle this problem. This is simply paraphrased in option (3).

16. Option (2) is correct.

In the first paragraph, the author says that earlier economists ignored psychology, today they put a great deal of emphasis on how happiness can shape economies and businesses. He also says this trend is disquieting and measuring happiness the primary goal can lead to unwanted consequences. So, you can infer that the author will prefer some middle way. Which is there in option (2).

17. Option (3) is correct.

The passage states, “they are increasingly used as a basis to transform or discipline individuals”. This is best paraphrased in option (3).

18. Option (3) is correct.

‘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.’ From these lines it can be understood that this shift in thinking has burdened people by making them believe that they are responsible for their happiness as well as failure which is reflected in option (3).

19. Option (1) is correct.

Option (2) and (3) are ruled out, because these two options indicate a trend that the author is warning about.

The author argues that such technologies should not be used. He just states that proliferation of such technologies, especially when used by external parties like nations and corporations, might put people under greater stress. Hence, option (4) is ruled out.

The passage states, “elaborate and intrusive ways of collecting data on well-being”. So, if it is proved that stakeholders are moving away from data collection. This is the idea given in option (1), which will weaken the author’s argument.

20. Option (2) is correct.

From the lines: ‘Dubai... 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.’, option (2) can be derived.

Nowhere it is mentioned that Dubai collaborates with Facebook or incentivises companies that prioritize worker welfare. Hence, options (1) and (4) are eliminated.

The author does not believe in happiness indicators being standard to measure happiness. So, option (3) can be ruled out.

21. Option (2) is correct.

Paragraphs 3 and 5 answer this question. Paragraph 3 bundles epigenetics and parental effects under ‘developmental factors’ and also mentions ecological legacies. Paragraph 5

lists that genomes, epigenetic modifications, inherited cultural factors and parental effects affect evolutionary adaptation. Option (2) covers all these. Hence, option (2) is the answer. Option (1), option (3), and option (4) misses ‘developmental factors’ and ‘antibodies’, ‘ecological legacies’, and ‘developmental factors’.

22. Option (2) is correct.

The passage doesn’t support the claim that Wilsons theory of evolution is scientifically superior to Darwin’s or Mendel’s. Hence, options (1) and (4) are eliminated. The passage states that theory of natural selection fails to explain the example quoted in the passage and goes on saying: “Yet new evidence from genomics, epigenetics and developmental biology indicates that evolution is more complex than we once assumed ...”. From this you can infer option (2). Hence, option (2) is the correct answer.

23. Option (2) is correct.

‘That is not supposed to happen. Generations of schoolchildren have been taught that the inheritance of acquired characteristics is impossible...’ Makes it clear that answer could be either option (1) or (2). Out of these two option, option (1) has to be eliminated, because it is too narrow to select as answer. Hence, option (2) is the correct answer.

24. Option (1) is correct.

The passage primarily wants to assert that evolution cannot be fully and satisfactorily explained by natural selection and subsequent inheritance alone, it is shaped by several factors—genomics, epigenetics and developmental biology. Only option 1 negates the main idea of the passage. Rest of the options would support this. Hence, option (1) is the correct answer.

25. Option (1) is correct.

The paragraph states that artificial embryo copies the natural twinning and that it is relatively low-tech twinning process, where in the first days after fertilization, the embryo splits into two genetically identical individuals. Option 1 rephrases this. Hence, option (1) is the correct answer.

Option 3 is out rightly eliminated, because it asserts that artificial embryo twinning is unlike natural twinning.

Option 2 is ruled out, as distorts the fact by saying that twins are formed during fertilization.

Option 4 is a bit vague and rather than saying artificial embryo mimics natural twinning, it says artificial embryo is like natural twinning.

26. Option (1) is correct.

The paragraph states that artificial embryo copies the natural twinning and that it is relatively low-tech twinning process, where in the first days after fertilization, the embryo splits into two genetically identical individuals. Option (1) rephrases this.

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Option (2) is ruled out, as it distorts the fact by saying that twins are formed during fertilization.

Option (4) is a bit vague and rather than saying artificial embryo mimics natural twinning, it says artificial embryo is like natural twinning.

27. Option (3) is correct.

The paragraph talks about conceptualization of landscape as a geometric object. And it asserts that study of landscape as a geometric object by Renaissance artists led to it being recognized as an independent genre/subject. Option (3) captures this idea best.

Option (1) is incorrect because it does not talk about how the field evolved as an independent genre.

Option (2) is ruled out because it fails to capture role played by Renaissance.

Option (4) is also ruled out because it gives an impression as if Renaissance artist were responsible for the study of landscape as a subject of art, but the paragraph says the artist helped it in evolving as an independent genre.

28. Correct answer is [1324].

(32) is an apparent sequence. (3) talks about twitter's policy. So does rest of the two sentences. (2) starts with a pronoun 'it' referring to twitter's website mentioned in sentence (3). Sentence (2) ends with "and much more" and sentence (4) states the implications of the term 'much more' and how it makes believing in the impartiality and objectivity of twitter hard. So, (324) is a sequence. Since all the three sentence

are talking about 'impartiality and objectivity' and makes it clear that it is hard to believe in impartiality and objectivity. Sentence 1, which is generic should start the paragraph.

29. Correct answer is [1432].

Statements (1) and (4) are connected because both talk about 'the canopy'. The order is (14) because (1) introduces the canopy talked about in statement (4). Similarly, statements (2) and (3) both talk about 'swift chasing insects'. The order of (2) and (3) is (32) because insects are already introduced in 4th statement. So, (3) must follow (4).

30. Correct answer is [2413].

Statement (2) is an obvious opener. It introduces the topic democracy and inequality. Statement (4) follows statement (2) because it elaborates (2). (24) is a sequence. Statement (4) talks about 'very rich people' and statement (1) talks about 'another group', the unwitting enablers. In statement (3) 'these people' refers the unwitting enablers mentioned in statement (1).

31. Correct answer is [4213].

Statement (4) is the best opening statement. It sets the background and portrays a person suffering from cancer. Sentence (2) states 'viola player did not know what it was', here 'what it was' refers to the lump stated in sentence (4). Another hint is 'the viola player', which definitely refers to 'Cathy Perkins' from the statement (4). (1) follows (4). Because it talks about diagnosis. And (3) follows (1) by telling that after treatment all seemed well but the routine scan tells that it is back again.

32. Option (5) is correct.

The paragraph talks about displacement of Bengal. Sentence (3) introduces the topic and sentence (2) further elaborates it. Sentence (1) concludes that the displacement is not very significant in magnitude and sentence (4) tells the reason why it is not very significant in magnitude. So, (4) is followed by (1). Only sentence (5) talks about rapid displacement and sensitizing the public to the human cost of displacement. This is not connected to the rest of the sentences.

33. Option (4) is correct.

The passage is about time inconsistency. It narrows down to immunization. All the

sentences talk about logic being responsible for postponement of immunization. The paragraph starts with a generic statement (1). (1) is followed by (3), which says it is hard to believe that people postpone immunization. (2)(5) is a mandatory pair. (2) tells how people should be fooling themselves to postpone immunization and (5) elaborates it. Only, sentence (4) talks about cost of immunization as a factor to postpone immunization.

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

The paragraph starts with sentence (1), which draws an analogy between bumblebee and translators. Sentence (1) is followed by sentence (5). It talks about flight of the bumblebee to be aerodynamically the impossible, which is further followed by sentence (3). Sentence (3) talks about similar impossibility of translation. And sentence (4) further states that both translators and bees have continued their work unaware of these deliberations. But sentence (2) does not fit in the sequence.

Data Interpretation and Logical Reasoning (DILR)

Solution for Questions 1 to 4:

$$\text{Total satellites} = 1600$$

Point 2: Satellites serving all three B, C and S = 100

Point 3: Satellites serving exclusively for C = satellites serving exclusively for S.

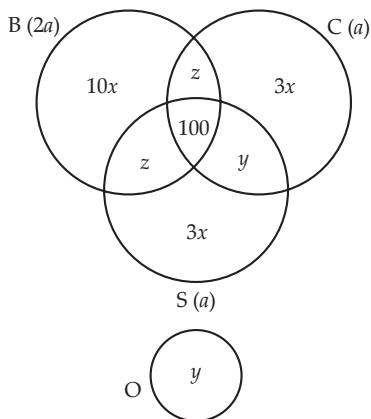
and this number is 30% of the number of satellites exclusively serving B.

Point 4: The number of satellites serving O is same as the number of satellites serving box C and S but not B.

Let $10x$ be number of satellites exclusively serving B.

Thus the number of satellites exclusive serving C and S = $\frac{30}{100} \times 10x = 3x$

and let y be number of satellites serving others.



$$\text{Now, } 10x + 2z + 2y + 6x + 100 = 1600$$

$$16x + 2y + 2z = 1500 \quad \dots(i)$$

$$\text{Given, } 10x + 2z + 100 = 2(3x + z + y + 100)$$

$$\Rightarrow 4x = 2y + 100 \quad \dots(ii)$$

By (i) and (ii), we get

$$8y + 400 + 2y + 2z = 1500$$

$$\Rightarrow 10y + 2z = 1100$$

$$\Rightarrow 5y + z = 550$$

$$\Rightarrow z = 550 - 5y$$

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

Number of satellites serving C

$$= 3x + y + z + 100$$

$$= 3(0.5y + 25) + y + (550 - 5y) + 100$$

$$= 725 - 2.5y$$

Maximum value when $b = 0$, is 725.

Now $d \geq 0$

$$\Rightarrow 555 - 5y \geq 0$$

$$\Rightarrow 110 \geq y$$

Maximum value of $y = 110$

Minimum value when $y = 110$ is 450.

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

The minimum possible value of satellites serving B exclusively are

$$4x = 2y + 100$$

$$\Rightarrow x = 0.5y + 25$$

$$\text{Now, } 10x = 5y + 250$$

Minimum will be when $y = 0$, i.e., 250

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

It is given that at least 100 of 1600 satellite were serving O.

$$\text{Means } 2x - 50 \geq 100$$

$$n \geq 75$$

$$\begin{aligned} \text{Number of satellite serving S} &= 100 + 800 - 10x + 2x - 50 + 3x \\ &= 850 - 5x \end{aligned}$$

$$\text{At } x_{\min} = 75$$

$$\begin{aligned} \text{Number of satellite serving S} &= 850 - 5 \times 75 \\ &= 475 \end{aligned}$$

$$\text{At } x_{\max} = 80$$

$$\begin{aligned} \text{Number of Satellites serving S} &= 850 - 5 \times 80 \\ &= 450 \end{aligned}$$

Hence, the number must be between 425 to 475.

4. Option (3) is correct.

As given atleast two among B, C and S = 1200

$$\begin{aligned} 800 - 10x + 800 - 10x + 2x - 50 + 100 &= 1200 \\ x &= 25 \end{aligned}$$

from this statement C is definitely false.

Solution for Questions 5 to 8:

$$\text{Total people} = 24$$

No. of Bureaucrats in research and teaching committees are equal.

Point 1: An research committee have 75% of number of bureaucrats in the admin team.

$$\begin{aligned} \text{So, Research} &\rightarrow 3x \\ \text{Teaching} &\rightarrow 3x \\ \text{Admin} &\rightarrow 4x \\ \text{Total} &\rightarrow 10x \end{aligned}$$

Point 3: 60% of politician are in administration committee. 20% are in teaching committee. So rest 20% be in research committee.

$$\begin{aligned} \text{Assume, Research} &\rightarrow z \\ \text{Teaching} &\rightarrow z \\ \text{Administration} &\rightarrow 3z \end{aligned}$$

Point 2: The number of educationalists in research team is average of teaching and administration team.

$$\begin{aligned} \text{Assume no. of educationalists in} \\ \text{Research} &\rightarrow y \\ \text{Teaching} &\rightarrow y - d \\ \text{Admin} &\rightarrow y + d \end{aligned}$$

	Research	Teaching	Admin
Bureaucrats	3x	3x	4x
Educationalists	y	y - d	y + d
Politician	z	z	3z

$$\begin{aligned} \text{Total} &= 4x + y + d + 3z + 3x + y + z \\ &+ 3x + y - d + z = 2y \end{aligned}$$

$$\text{or } 10x + 3y + 5z = 2y$$

It is only possible when

$$x = 1, y = 3 \text{ \& } z = 1$$

Now, total bureaucrats = $10x = 10$

$$\text{Total politician} = 5z = 5$$

$$\text{Total educationalist} = 3y = 9$$

and possible values of $d = 1$ or 2

Point 2: d

	Research	Teaching	Admin
Bureaucrats	3	3	4
Educationalist	3	2/1	4/5
Politician	1	1	3

5. Option (3) is correct.

Size of research committee is less than the size of teaching committee is false.

6. Correct answer is [4].

As number of Bureaucrats in Admin team = 2

7. Correct answer is [3].

As number of Educationalists in team = 3

8. Option (1) is correct.

As per table size of teaching committee cannot be define.

Solution for Questions 9 to 12:

All three sections DI, WE and GA have 20 marks each.

Composite score (out of 80)

$$= 2 [DI] = WE + GA$$

For selection candidate have to score atleast 70% marks in two sections.

Point 2: Ajay have highest score in WE. As Ester have already 18 in WE. So, possible score for Ajay is 19/20.

Points 3 & 4: Accruited candidates: Geeta, Indu

Point 6: Indu and Jatin both scored 100% in exactly one section.

As per table Jatin scored in DI = 20 marks

For Indu if assume DI marks = 20

$$\begin{aligned} \text{then composite marks} &= 2 \times 20 + 8 + x \\ &= 48 + x \end{aligned}$$

As composite score of Jatin

$$= 20 + 16 + 14 = 70$$

Indu, composite score

$$= 70 - 10 = 60$$

Now, equating these two

$$48 + x = 60$$

$$x = 12$$

But already known that Indu is recruited.

Means $x = 12$ is not possible.

It is clear now Indu score in GA = 20

again let she scored in DI = y

so, $2y + 8 + 20 = 60$

$$y = 60 \text{ [Marks in DI]}$$

Table till now:

Candidate	Marks out of 20			Composite Score
	DI	WE	GA	
1. Ajay	8	19/20	16	
2. Bala		9	11	
3. Chetna	19	4	12	54
4. Danish	8	15	20	51
5. Ester	12	18	16	58
6. Falak	15	7	10	47
7. Geeta	14		6	
8. Harini	5		20	
9. Indu	16	8	20	60
10. Jatin	20	16	14	70

Till now recruited candidates = Indu, Jatin, Geeta

Also known that 4th recruited candidate scored more than Geeta.

Maximum possible marks for Geeta

$$= 2 \times 14 + 6 + WE_{\max}$$

$$\text{[where } WE_{\max} = 20\text{]}$$

$$= 28 + 6 + 20 = 54$$

This value is also not possible because Chetna already scored 54. So, max marks in WE will be less than 20.

So, that means Ester is 4th candidate who recruited.

And Geeta score in WE = 19 and Ajay score in WE = 20

Now,

	DI	WE	GA	Composite Score
Ajay	8	20	16	52
Geeta	14	19	6	53

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

Jatin's composite score = 70 ...**(i)**

Danish's composite score = 51 ...**(ii)**

Indu's score in DI = 16 ...**(iii)**

Chetna's score in DI = 19 ...**(iv)**

Clearly (i) > (ii) & (iii) < (iv)

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

As we know Jatin, score in DI = 20

If Bala also scored 20 in DI then

$$\begin{aligned} \text{Composite score of Bala} &= 2 \times 20 + 9 + 11 \\ &= 60 \end{aligned}$$

Which is not possible.

11. **Correct answer is [13].**

Assume Bala's score in DI = x

$$2x + 9 + 11 < 54$$

$$x < 17$$

But already Indu = 16, Geeta = 14, Falak = 15

So, may possible marks for Bala = 13

12. **Correct answer is [14].**

If see the table, marks already scored in

$$WE = 20, 19, 18, _, 16, 15 _ _ _$$

Means possible marks for Harini = 17 or 14 or 13.

Case 1: If Harini scored 17 marks in WE. Then composite marks

$$= 2 \times 5 + 17 + 20$$

$$= 47$$

Already Falak's composite marks = 47

So, this case in not possible.

Case 2: If Harini scores 14 marks. The composite marks of Harini

$$= 2 \times 5 + 14 + 20$$

$$= 44$$

This case is possible. So, max possible score in WE for Harini is 14.

Solution for Questions 13 to 16:

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

Given that sales figure during 3 month of second quarter (April, May, June) of 2016 form an arithmetic progression.

and some for three months (Oct, Nov & Dec.) in 2016

$$\text{As sales in Apr. 2016} = 40$$

and if common difference = x

$$\text{then sales in May 2016} = 40 + x$$

$$\text{\& sales in June 2016} = 40 + 2x$$

$$\text{and given } 40 + 40 + x + 40 + 2x = 150$$

$$x = 10$$

Means in May sales is = $40 + 10 = 50$

in June sales is = $50 + 10 = 60$

Similarly for Oct., Nov. and Dec.

in Oct. sales = 100

so Nov. sales = $100 + x$
 Dec. sales = $100 + 2x$
 And $100 + 100 + x + 100 + 2x = 360$
 $x = 20$

So, Sales in Nov. = 120
 Sales in Dec. = 140

So, percentage change = $\frac{180 - 140}{40}$
 $= 28.57\%$

14. Option (2) is correct.

Percentage increase in Q_1
 from 2016 to 2017
 $= \frac{380 - 240}{240} \times 100$
 $= 58.33\%$

In Q_2 :
 $\frac{200 - 150}{150} \times 100 = 33.33\%$

In Q_3 :
 $\frac{220 - 250}{250} = -12\%$

In Q_4 :
 $\frac{500 - 360}{360} \times 100 = 33.33\%$

Therefore, the percentage increase is highest in Q_1 from 2016 to 2017.

15. Option (1) is correct.

In 2016, Percentage change from Q_1 to Q_2 :

$\frac{150 - 240}{240} \times 100 = -37.5\%$

Q_2 to Q_3 :
 $\frac{250 - 150}{150} \times 100 = 66.66\%$

Q_3 to Q_4 :
 $\frac{360 - 250}{250} \times 100 = 44\%$

In 2017,
 Percentage change from

Q_1 to Q_2 :
 $\frac{200 - 380}{380} \times 100 = -47.4\%$

Q_2 to Q_3 :
 $\frac{220 - 200}{200} \times 100 = 10\%$

Q_3 to Q_4 :

$\frac{500 - 220}{220} \times 100 = 127.27\%$

Therefore, in quarter Q_2 of 2017 the percentage decrease in sales from previous quarter sale is highest.

16. Option (2) is correct.

Percentage increase in sales from previous month in:

March 2016 = $\frac{100 - 60}{60} \times 100$
 $= 66.67\%$

October 2016 = $\frac{100 - 55}{55} \times 100$
 $= 81.82\%$

March 2017 = $\frac{160 - 100}{100} \times 100$
 $= 60\%$

October 2017 = $\frac{150 - 70}{70} \times 100$
 $= 114.287$

Clearly the percentage increase is maximum in October 2017.

Solution for Questions 17 to 20:

17. Correct answer is [4].

There is 3×3 matrix means total 9 cell have to be fill.

No two adjacent cells have same numeral.

So, fill by 1 from first cell and use it as many time as it possible.

1		1
1		1

Now fill 2 at two places.

1	2	1
1	2	1

Now fill 3 at two places.

1	2	1
3		3
1	2	1

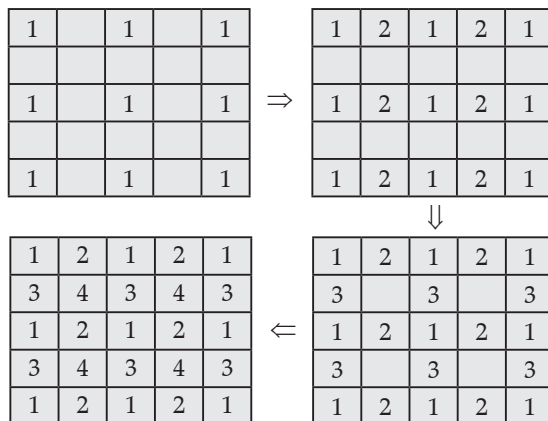
Only place left which can be filled by 4.

So, total 4 digits requires to fill.

1	2	1
3	4	3
1	2	1

18. **Correct answer is [25].**

A 5×5 matrix means total 25 cells are there. Again start filling by 1 as in previous question. As we can see total 4 numbers are required to fill all cells without violating the conditions.



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

As we already made 5×5 matrix with 4 numbers

1	2	1	2	1
3	4	3	4	3
1	2	1	2	1
3	4	3	4	3
1	2	1	2	1

Going to replace it by 4 as a mistake.

But still 4 numbers are required to fill all cells.

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

Since, all the cells adjacent to a cell must have different numeral. We know that central cell have maximum number of adjacent cell. So start filling with number from central cell.

	2	3	4	
	9	1	5	
	8	7	6	

Now fill the rest cells by using these numbers and follow the condition.

4	7	8	6	7
5	2	3	4	9
6	9	1	5	2
3	8	7	6	8
2	5	4	3	9

So, we need total 9 numerals to fill this matrix as per the condition.

Solution for Questions 21 to 24:

21. **Correct answer is [7].**

If customer gives preference to ₹500 notes then number of ₹500 notes dispensed must be greater than the number of the notes of other denominations dispensed.

Assume ₹3500 is dispensed ₹500 notes, means ₹7 notes of ₹500 denomination. That no. of notes must be greater than other notes.

Least number of notes possible

$$= 7 \times 200 + 1 \times 100 = 1500$$

Total notes = 8

So, this case is not possible.

Now, assume ₹4000 is dispensed ₹500 notes. So, total notes of ₹500 denomination = 8

Possible cases

₹500 notes	₹200 notes	₹100 notes	
8×500	3×200	4×100	[7 notes]
	4×200	2×100	[6 notes]
	5×200	0×100	[0 notes]

Total 3 cases are valid.

Now, assume ₹4500 is dispensed in ₹500 notes.

So, possible valid cases

500 notes	200 notes	100 notes	
9×500	0×200	5×100	[5 notes]
	1×200	3×100	[4 notes]
	2×200	1×100	[3 notes]

There are 3 valid cases.

Assume, ₹5000 is dispensed using ₹10, ₹500 notes.

So, only one valid cases.

So, total number of valid case = $3 + 3 + 1 = 7$

22. **Correct answer is [6].**

As calculated that 3 cases are possible when 500 rupee notes as their preference.

1. ₹4000 of ₹500 notes means 8 notes

2. ₹4500 of ₹500 notes means 9 notes

3. ₹5000 of ₹500 notes means 10 notes

So, least no. of ₹500 notes required to save a customer is 8.

By 50 notes of ₹500 we can serve max $\left[\frac{50}{8}\right]$
= 6 customers.

23. Option (1) is correct.

Total number of ₹500 notes = 50

A customer to be served max 20 notes per withdraw.

So, here we have to minimize the number of ₹500 notes.

Possible cases

1. No ₹500 notes then minimum 25 notes required to dispense ₹5000 so not possible/valid case.

2. One ₹500 note and rest ₹200 & ₹100 notes.
Then minimum possible notes
= $22 \times 200 + 1 \times 100 + 1 \times 500$
= 5000

$$\Rightarrow 22 + 1 + 1 = 24 \text{ notes}$$

Not valid case.

3. Two ₹500 notes then minimum 20, ₹200 notes require so not valid case.

4. Three ₹500 notes then still 17, ₹200 notes and 1, ₹100 notes required. So not valid.

5. If four 500 notes then 15, two hundred notes required. So, total $4 + 15 = 19$ is less than 20. So valid case.

Therefore, total number of customer can be

$$\text{served} = \frac{50}{4} = 12 \text{ customers}$$

24. Option (1) is correct.

As given number of notes dispensed is the smallest possible. So, we have to minimise the number of notes dispensed in each 2 cases.

Case 1: As ₹500 notes in the preference and have to minimize the number of notes as well.

So, total no. of notes = 10 [₹500 denomination]

So, for 50 customers total notes required
= $50 \times 10 = 500$

Case 2: As ₹100 notes are preference and number of notes to be minimum. Means dispense more number of ₹500 notes as possible

Only possible case = 10 [₹100 notes]

+ 8 [₹500 notes]

So, number of ₹500 notes required

$$= 8 \times 50 = 400$$

So, total number of ₹500 notes required for 50 customers = $500 + 400 = 900$ notes

Solution for Questions 25 to 28:

Four female \Rightarrow Andriana, Bandita, Chitra and Daisy

Four male \Rightarrow Amit, Barun, Chetan and Deb

Institute X \Rightarrow 3 students [2 male, 1 female]

Institute Y \Rightarrow 3 students [2 male, 1 female]

Institute Z \Rightarrow 3 students [2 female]

Point 2: Both student from Y minor in finance and female student major in operation.

Point 6: Barun is from Y and major in operation.

Chetan is from X and major in finance.

Now,

College	X			Y			Z	
Gender	M	M	F	M	M	F	F	F
Name	Chetan			Barun				
Major	Finance			OPS		OPS		
Minor				Finance	Finance			

Point 5: Andriana and Deb. are from same team:

Daisy and Amit are from same team.

Point 7: Daisy minors in operation.

So, as minor and major subject cannot be same and female candidate of Y have major in operations. So Daisy is in X institute.

and X institute \Rightarrow

M	M	F
Chetan	Amit	Daisy

and Y institute \Rightarrow

M	M	F
Barun	Deb	Andriana

and Z institute \Rightarrow

F	F
Bandita	Chitra

Point 3: One male student majors in operation.

Three female students minor in marketing are and Daisy is minor in operations.

Means rest 3 females are minors in marketing.

Point 4: One female and two male students are majors in finance.

Means \Rightarrow Amit is major in finance.

College	X			Y			Z	
Gender	M	M	F	M	M	F	F	F
Name	Chetan	Amit	Daisy	Barun	Deb	Andriana	Bandita	Chitra
Major	Finance	Finance		OPS	Marketing	OPS		
Minor			OPS	Finance	Finance	Marketing	Marketing	Marketing

25. Option (3) is correct.

From the above data table we conclude that Bandita and Chitra are from institute Z.

26. Option (2) is correct.

From the above data table we conclude that Deb is minor in finance.

27. Option (4) is correct.

From the above data table we conclude that Amit is major in finance

28. Option (3) is correct.

From the above data table we conclude that if Chitra is major in finance and given that one female student major in finance. Then Bandita cannot do in finance. So Bandita should be major in operations.

Solution for Questions 29 to 32:

Point 2: P₆ level → low

Point 3: P₇ & P₈ were only two consecutive pumps recorded same level. And P₆ already low. So, only possible condition, when point 1 also considered.

- P₁ → High
- P₂ → Medium
- P₃ → High
- P₄ → Medium
- P₅ → High
- P₆ → Low

Point 4: P₁₆ to P₂₀ = No pump recorded high school.

Point 5: The number of high level pumps = 2
[the number of low level pumps]

Petrol Pump	Fuel contamination level
P ₁	High
P ₂	Medium
P ₃	High
P ₄	Medium
P ₅	High
P ₆	Low
P ₇	High

P ₈	High
P ₉	Medium
P ₁₀	High
P ₁₁	Medium/Low
P ₁₂	High/Medium/Low
P ₁₃	High/Medium/Low
P ₁₄	High/Medium/Low
P ₁₅	High/Medium/Low
P ₁₆	Low/Medium
P ₁₇	Low/Medium
P ₁₈	Low/Medium
P ₁₉	Low/Medium
P ₂₀	Low/Medium

29. Option (4) is correct.

The contamination level at P₁₀ recorded high.

30. Option (3) is correct.

As number of high rated pumps is twice the number of low rated pumps. So there sum must be multiple of 8.

So, there can be only 8 medium rated pumps.

31. Option (4) is correct.

If P₁₁ recorded log then the table is as follows:

Petrol Pump	Level	Petrol Pump	Level
P ₁	M	P ₁₁	L
P ₂	M	P ₁₂	M
P ₃	M	P ₁₃	H
P ₄	M	P ₁₄	M
P ₅	H	P ₁₅	H
P ₆	L	P ₁₆	M
P ₇	H	P ₁₇	L
P ₈	H	P ₁₈	M
P ₉	M	P ₁₉	L
P ₁₀	H	P ₂₀	M

So, the contamination level at P₁₄ recorded as medium.

32. Option (2) is correct.

If P₁₅ → Medium

then table:

Petrol Pump	Level	Petrol Pump	Level
P ₁	I	P ₁₁	M
P ₂	M	P ₁₂	H
P ₃	H	P ₁₃	M
P ₄	M	P ₁₄	H
P ₅	H	P ₁₅	M

P ₆	L	P ₁₆	L
P ₇	H	P ₁₇	M
P ₈	H	P ₁₈	L
P ₉	M	P ₁₉	M
P ₁₀	H	P ₂₀	L

So, P₁₁ and P₁₆ not recorded same.

Quantitative Aptitude (QA)

1. Correct answer is [50].

Let 'v' and 'u' be the speed (in km/hr) of cars starting from both A and B respectively.

If they both move in east direction, then B will catch A if and only if $u > v$.

Relative speed of both the cars when they move in east direction = $(u - v)$ km/hr

It takes them 7 hours to meet. *i.e.* they travel 350 km in 7 hours with a relative speed of $(u - v)$ km/hr.

$$\text{Hence, } (u - v) = \frac{350}{7} = 50 \text{ km/hr.}$$

2. Correct answer is [12].

Let, the distance between A and B be $4d$.

Length of BP is thrice the length of AP.

If AP = d then BP = $3d$

Let, the speed of car 1 be s and the speed of car 2 be $0.5s$.

Car 2 reaches P one hour (60 minutes) after Car 1 reaches P.

$$\Rightarrow \frac{d}{s} + 60 = \frac{3d}{0.5s}$$

$$\Rightarrow \frac{d}{s} + 60 = \frac{6d}{s}$$

$$\Rightarrow \frac{5d}{s} = 60$$

$$\Rightarrow \frac{d}{s} = 12$$

Hence, time taken by Car 1 = 12 minutes

3. Correct answer is [1,21,000].

By the end of 2 years 2,10,000 will amount to $2,10,000 \times 1.1 \times 1.1 = ₹2,54,100$

Let the amount paid as installment every year be ₹ x .

John would pay the first installment by the end of the first year. Additionally he needs to pay extra $0.1x$ in the next year. Hence, he pays $1.1x$ in the 2nd year

$$\Rightarrow 1.1x + x = 2,54,100$$

$$\Rightarrow 2.1x = 2,54,100$$

$$\Rightarrow x = ₹1,21,000$$

4. Correct answer is [10].

Let, the efficiency of filling pipes be 'x' and the efficiency of draining pipe be '-y'.

In the first case,

$$\text{Capacity of tank} = (6x - 5y) \times 6 \quad \dots(i)$$

In the second case,

$$\text{Capacity of tank} = (5x - 6y) \times 60 \quad \dots(ii)$$

On equating (i) and (ii), we get

$$(6x - 5y) \times 6 = (5x - 6y) \times 60$$

$$\text{or, } 6x - 5y = 50x - 60y$$

$$\text{or, } 44x = 55y$$

$$\text{or, } 4x = 5y$$

$$\text{or, } x = 1.25y$$

$$\text{Capacity of the tank} = (6x - 5y) \times 6$$

$$= (7.5y - 5y) \times 6 = 15y$$

Net efficiency of 2 filling and 1 draining pipes =

$$(2x - y) = (2.5y - y)$$

$$= 1.5y$$

$$\text{Time required} = \frac{15y}{1.5y} \text{ hours} = 10 \text{ hours}$$

5. Correct answer is [60].

Let, A and n be the average score and total number of tests the aspirant appears.

If we exclude the first 10 and last 10 tests, then the remaining tests = $n - 20$

Let, x be the average of $(n - 20)$ tests.

When first 10 tests are not considered, we have

$$\frac{[(n - 20)x + 10 \times 30]}{(n - 10)} = A + 1 \quad \dots(i)$$

When last 10 tests are not considered, we have

$$\frac{[10 \times 20 + (n - 20)x]}{(n - 10)} = A - 1 \quad \dots(ii)$$

Subtracting (ii) from (i),

$$\frac{(n-20)x + 10 \times 30}{(n-10)} - \frac{[10 \times 20 + (n-20)x]}{(n-10)} = 1 + 1$$

$$\Rightarrow \frac{100}{(n-10)} = 2$$

$$\Rightarrow n - 10 = 50$$

$$\Rightarrow n = 60$$

Hence, $n = 60$ questions

6. Option (4) is correct.

The possible average age of people whose ages are below 51 years will be maximum if the average age of the number of people aged 51 years and above is minimum.

Hence, we can say that there are 30 people having same age 51 years.

Let 'x' be the maximum average age of people whose ages are below 51.

Then we can say that,

$$\frac{51 \times 30 + 39 \times x}{30 + 39} = 38$$

Hence, $x = 28$

7. Option (2) is correct.

Assume Marks = 100N

Pass Marks = 45N

Marks obtained = 36

Hence, the obtained marks is 32% of pass marks
 $= 100 - 68 = 32\%$

Hence, 32% of 45N = 36

$$N = \frac{36 \times 100}{45 \times 32}$$

$100N = 250$

8. Option (1) is correct.

Let the cost price of peanuts for the wholesaler be x per kg.

Cost price of walnuts for the wholesaler is $3x$ per kg.

The wholesaler sold 8 kg of peanuts at 10% profit and 16 kg of walnuts at 20% profit to a shopkeeper.

Total cost price to the shopkeeper

$$= (8)(x)(1.1) + 16(3x)(1.2) = 66.4x$$

The shopkeeper lost 5 kg walnuts and 3 kg peanuts.

The shopkeeper sold the mixture of 11 kg walnuts and 5 kg peanuts.

His total selling price = $166 \times (16) = 2656$

His total cost price = $2656(100/125) = 2124.8$

Now, $66.4x = 2124.8$

$$\Rightarrow x = 32$$

Price at which the wholesaler bought walnuts = $3x = 3 \times 32 = 96$ per kg

9. Option (3) is correct.

Let the Cost price of tea A & B be 'a' & 'b' respectively. The profit is 10% if A and B are mixed in the ratio 3 : 2

$$\Rightarrow \text{Fraction of tea A \& B} = \frac{3a}{5} \& \frac{2b}{5}$$

Also, S.P. = 110% of C.P.

$$\Rightarrow 40 = \frac{110}{100} \times (3a + 2b) \dots(i)$$

The profit is 5% if A and B are mixed in the ratio 2 : 3

$$\Rightarrow \text{Fraction of tea A \& B} = \frac{2a}{5} \& \frac{3b}{5}$$

S.P. = 105% of C.P.

$$\Rightarrow 40 = \frac{105}{100} \times (2a + 3b) \dots(ii)$$

Solving (i) and (ii), we get $a : b = 19 : 24$

10. Option (3) is correct.

Let, the efficiency of humans be 'h' and the efficiency of robots be 'r'.

In the first case,

$$\text{Total work} = (15h + 5r) \times 30 \dots(i)$$

In the second case,

$$\text{Total work} = (5h + 15r) \times 60 \dots(ii)$$

On equating (i) and (ii), we get

$$(15h + 5r) \times 30 = (5h + 15r) \times 60$$

$$\text{Or, } 15h + 5r = 10h + 30r$$

$$\text{Or, } 5h = 25r$$

$$\text{Or, } h = 5r$$

$$\text{Total work} = (15h + 5r) \times 30$$

$$= (15h + h) \times 30 = 480h$$

$$\text{Time taken by 15 humans} = \frac{480h}{15h} = 32 \text{ days}$$

11. Option (4) is correct.

Let, the number of marbles with Raju and Lalitha initially be $4x$ and $9x$.

Let, the number of marbles that Lalitha gave to Raju be a .

$$\text{It has been given that } \frac{(4x + a)}{(9x - a)} = \frac{5}{6}$$

$$24x + 6a = 45x - 5a$$

$$11a = 21x$$

$$\frac{a}{x} = \frac{21}{11}$$

Fraction of original marbles given to Raju by

Lalitha = $\frac{a}{9x}$ (Since, Lalitha had $9x$ marbles initially).

$$\frac{a}{9x} = \frac{21}{99} = \frac{7}{33}$$

The moment you see $\frac{a}{x} = \frac{21}{11}$, the denominator of the option should be a multiple of 11.

12. Option (1) is correct.

Suppose A needs '16a' days to complete the job and B needs '20a'.

Number of days needed by A to complete half of the job = $8a$

Number of days needed by B to complete 5% of the job = $\frac{20a}{20} = a$

$$8a + 4 + a = 13$$

$$a = 1$$

∴ B alone can finish the entire job in 20 days.

13. Option (3) is correct.

Let's assume the cost price of paint B is ₹ x per litre and paint A is ₹ $x + 8$ per litre.

The selling price of 10 litres of mixture is ₹264 with 10% profit. Hence, the total cost price = ₹240. And, the cost price per litre is ₹24.

Using alligation and mixture formula, $\frac{B}{A} = \frac{(x+8-24)}{(24-x)}$, where the mean price is ₹24

and B is the cheaper material and A is the dearer material.

When we increase the cost of paint B, the cost of paint A will increase too. If the cost price of the mixture is closer to the cost of paint B, then the amount of paint B present in the mixture should be greater than the amount of paint A present in the mixture.

The highest possible cost of paint B will be obtained when the volumes of paint A and paint B in the mixture are equal.

$$\therefore A = B$$

$$x + 8 - 24 = 24 - x$$

On solving, we get,

$$\Rightarrow 2x = 40$$

$$\text{₹}x = 20$$

Hence, the highest possible cost of paint B is ₹20 per litre.

$$\Rightarrow x = \text{₹}20$$

Shortcut Method:

See the options - price of paint B is given 16, 26, 20, 22

We know by selling the mixture at - 240 C.P. of 1 litre is 24.

Viz. 16 and 26 are ruled out. Because in that case C.P. of paint A will be 24 and 34 respectively. So, price of the resulting mixture is 24 not possible.

Now see 20 and 22

⇒ C.P. of A is 28 and 30 respectively.

$\begin{matrix} \textcircled{B} & & \textcircled{A} \\ 20 & & 28 \\ & \diagdown & / \\ & 24 & \\ & / & \diagdown \\ \cancel{4} & : & \cancel{4} \\ 1 & : & 1 \\ \text{(Possible)} & & \end{matrix}$	$\begin{matrix} \textcircled{B} & & \textcircled{A} \\ 22 & & 30 \\ & \diagdown & / \\ & 24 & \\ & / & \diagdown \\ \cancel{6} & : & \cancel{2} \\ 3 & : & 1 \\ \text{(not possible because)} & & \\ \text{Amount of B should not} & & \\ \text{exceed that of A)} & & \end{matrix}$
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Hence, answer is ₹20.

14. Option (4) is correct.

Partha takes four hours more than Narayan to reach B

Let, the time taken by Partha = t & that of Narayan = $t - 4$

⇒ Speed of Partha, $VP = \frac{60}{t}$ & Speed of

Narayan, $VN = \frac{60}{(t-4)}$

Partha reaches the mid-point of A and B two hours before Narayan reaches B

$$\Rightarrow \frac{60}{VN} - \frac{30}{VP} = 2$$

$$\Rightarrow (t-4) - \frac{t}{2} = 2 \text{ (Substituting for VP and VN)}$$

$$\Rightarrow 2t - 8 - t = 4$$

$$\Rightarrow t = 12$$

$$\Rightarrow \text{the Speed of Partha, } VP = \frac{60}{t} = \frac{60}{12} = 5$$

15. Option (4) is correct.

Let the area of ABCD be 100.

Side of ABCD = 10,

Area of EFGH is 62.5 ⇒ Side of EFGH = $\sqrt{62.5}$

Triangles AEH, BFE, CGF and DHG are congruent by ASA.

Let $AE = BF = CG = DH = x$;
 $\therefore EB = FC = DG = AH = 10 - x$
 $AE^2 + AH^2 = EH^2$
 $x^2 + (10 - x)^2 = (62.5)^2$

Solving, $x = 2.5$ or 7.5
 Since, it's given that CG is longer than EB,
 $CG = 7.5$ and $EB = 2.5$.
 $\therefore EB : CG = 1 : 3$

16. Option (1) is correct.

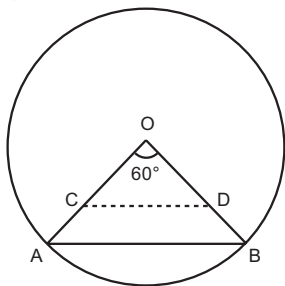
Let the 6 cm long chord be x cm away from the centre of the circle. Let the radius of the circle be r cm.

The perpendiculars from the centre of the circle to the chords bisect the chords.

$$r^2 = x^2 + 3^2 = (x + 1)^2 + 2^2$$

Solving, $x = 2$ and $r = \sqrt{13}$

17. Option (3) is correct.



It is given that radius of the circle = 1 cm
 Chord AB subtends an angle of 60° on the centre of the given circle. R be the region bounded by the radii OA, OB and the arc AB.

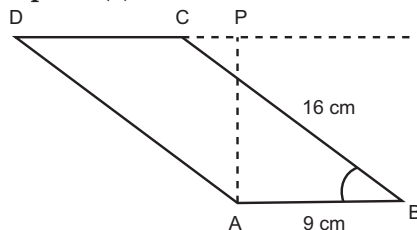
Therefore, $R = \frac{60}{360} \times \pi \times 1 \times 1 = \frac{\pi}{6}$

It is given that $OC = OD$ and area of triangle OCD is half that of R. Let $OC = OD = x$.

Area of triangle COD = $\frac{1}{2}$ of $\frac{\pi}{6} = \frac{1}{2} \times OC \times OD \times \sin 60$

Solving we get $x = \left(\frac{\pi}{3\sqrt{3}}\right)^{1/2}$

18. Option (1) is correct.



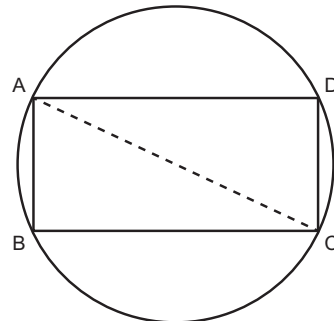
Area of the parallelogram
 $ABCD = (\text{base})(\text{height}) = (CD)(AP)$
 $= 72 \text{ sq.cm.}$

Since, $(CD)(AP) = 72$
 then $9(AP) = 72$
 $\Rightarrow AP = 8$
 Therefore, $DP^2 = AD^2 - AP^2$
 $= 16^2 - 8^2$

Hence, $DP = 8\sqrt{3}$

Area of triangle APD = $\frac{1}{2} (AP)(PD) = 32\sqrt{3}$

19. Option (1) is correct.



Since, the radius of the circle is 13 cm. The length of diagonal is 26 cm.

Using Pythagoras theorem,

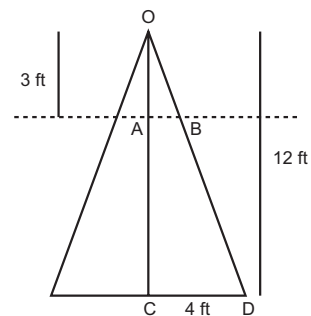
$$(\text{Diagonal})^2 = (\text{Length})^2 + (\text{Breadth})^2$$

$$(26)^2 = (L)^2 + (B)^2$$

$$676 = (L)^2 + (B)^2$$

From the options 24 and 10 satisfy the values of L and B.

20. Correct answer is [198].



Volume of the mother cone = $\left(\frac{1}{3}\right) \times \left(\frac{22}{7}\right) \times (4^2)$

$\times 12 \text{ cub feet} = \left(\frac{22}{7}\right) \times 64 \text{ ft}$

When the mother cone is cut at a height 9 feet from the base; height of the remaining part of the cone

$$= (12 - 9) \text{ ft} = 3 \text{ ft}$$

And radius of the base of the new cone is

$$\left(\frac{4 \times 3}{12}\right) \text{ ft} = 1 \text{ ft}$$

So, volume of the remaining part of cone

$$= \left(\frac{1}{3}\right) \times \left(\frac{22}{7}\right) \times (1, 2) \times (3) \text{ cu ft}$$

$$= \left(\frac{22}{7}\right) \text{ cu ft}$$

And, volume of the frustum part

$$= \left(\frac{22}{7}\right) \times (64 - 1) \text{ cu ft}$$

$$= \left(\frac{22}{7}\right) \times 63 \text{ cu ft}$$

$$= 198 \text{ cu ft}$$

21. Option (4) is correct.

$$x^{2018} y^{2017} = \frac{1}{2} \quad \dots\text{(i)}$$

$$\text{and } x^{2016} y^{2019} = 8 \quad \dots\text{(ii)}$$

Dividing (i) by (ii),

$$\frac{x^2}{y^2} = \frac{1}{16}$$

$$\frac{x}{y} = \frac{1}{4} \text{ i.e., } x = \pm \frac{1}{4} y$$

$$\left(\pm \frac{1}{4} y\right)^{2018} y^{2017} = \frac{1}{2}$$

$$\Rightarrow y^{4035} = 2^{4035}$$

$$\Rightarrow y = 2$$

$$\text{Therefore, } x = \pm \frac{1}{4} y = \pm \frac{1}{2}$$

$$\text{Hence, } x^2 + y^3 = \frac{1}{4} + 8 = \frac{33}{4}$$

22. Option (4) is correct.

$$\text{Given, } 2^x = 3^{\log_5 2}$$

$$\Rightarrow 2^x = 3^{\log_5 3}$$

$$\Rightarrow x = \log_5 3$$

$$\Rightarrow x = \log_5 \frac{3 \times 5}{5}$$

$$\Rightarrow x = \log_5 5 + \log_5 \frac{3}{5}$$

$$\Rightarrow x = 1 + \log_5 \frac{3}{5}$$

23. Option (4) is correct.

$$\log_{12} 81 = p$$

$$\Rightarrow \log_{12} 3^4 = p$$

$$\Rightarrow 4 \log_{12} 3 = p$$

$$\Rightarrow \frac{p}{4} = \log_{12} 3$$

$$= 3 \left(\frac{4-p}{4+p} \right) = 3 \left(\frac{1-\frac{p}{4}}{1+\frac{p}{4}} \right)$$

$$= 3 \left(\frac{1 - \log_{12} 3}{1 + \log_{12} 3} \right)$$

$$= 3 \left(\frac{\log_{12} 12 - \log_{12} 3}{\log_{12} 12 + \log_{12} 3} \right)$$

$$= 3 \left(\frac{\log \left(\frac{12}{3} \right)}{\log \left(\frac{12}{3} \right)} \right)$$

$$= 3 \frac{\log 4}{\log 36} = 3 \log_{36} 4$$

$$= \log_6 8$$

24. Option (1) is correct.

$$\log_2 (5 + \log_3 a) = 3$$

$$5 + \log_3 a = 2^3 = 8$$

$$\log_3 a = 3$$

$$\text{so } a = 3^3 = 27$$

$$\text{Now } \log_5 (4a + 12 + \log_2 b) = 3$$

$$\text{or } 4a + 12 + \log_2 b = 125$$

$$\log_2 b = 125 - 12 - 4 \times 27$$

$$= 5$$

$$\text{So, } b = 2^5 = 32$$

$$\text{Thus } a + b = 59$$

25. Option (3) is correct.

$$u^2 + (u - 2v - 1)^2 = -4v(u + v)$$

$$\Rightarrow u^2 + u^2 + 4v^2 + 1 - 4uv + 4v - 2u + 4vu + 4v^2 = 0$$

$$\Rightarrow 2u^2 - 2u + 8v^2 + 4v + 1 = 0$$

$$\Rightarrow 2 \left(u^2 - u + \frac{1}{4} \right) + 2 \left(4v^2 + 2v + \frac{1}{4} \right) = 0$$

$$\Rightarrow 2 \left(u - \frac{1}{2} \right)^2 + 2 \left(2v + \frac{1}{2} \right)^2 = 0$$

$$\Rightarrow u - \frac{1}{2} = 0; 2v + \frac{1}{2} = 0$$

$$u = \frac{1}{2} \text{ and } v = -\frac{1}{4}$$

$$u + 3v = \frac{1}{2} - \frac{3}{4} = -\frac{1}{4}$$

26. Correct answer is [54].

$$f(x+2) = f(x) + f(x+1)$$

$$f(11) = 91$$

Let

$$f(12) = a$$

$$f(13) = 91 + a$$

$$f(14) = 91 + 2a$$

$$f(15) = 182 + 3a$$

This is also equal to 617.

$$182 + 3a = 617$$

$$\Rightarrow a = 145$$

$$f(10) = f(12) - f(11)$$

$$= 145 - 91 = 54$$

27. Correct answer is [5].

x	2^x	2^{x+2}	Divisible by 3 or 4	Falls in the given Range
0	1	3	Yes	Yes
1	2	4	Yes	Yes
2	4	6	Yes	Yes
3	8	10	No	No
4	16	18	Yes	Yes
5	32	34	No	Yes
6	64	66	Yes	Yes
7	128	130	No	No

From the table required integers are (0, 1, 2, 4 & 6).

28. Correct answer is [40].

We know that one of the 3 numbers is 37.
 Let the product of the other 2 numbers be x .
 It has been given that

$$73x - 37x = 720$$

$$\therefore 36x = 720$$

$$\therefore x = 20$$

Product of 2 real numbers is 20.
 We have to find the minimum possible value of the sum of the squares of the 2 numbers.

Let

$$x = a \times b$$

It has been given that

$$a \times b = 20$$

The sum of squares will be minimum when the sum will be minimum and this happens when

$$a = b$$

Hence, the value of a and b will be $\sqrt{20}$.
 Sum of the squares of the 2 numbers

$$= a^2 + b^2 = 20 + 20 = 40$$

29. Correct answer is [502].

As the digits appear in ascending order in the numbers, number of ways of forming a n -digit number using the 9 digits = 9C_n
 Number of possible two-digit numbers which can be formed

$$= {}^9C_2 + {}^9C_3 + {}^9C_4 + {}^9C_5 + {}^9C_6 + {}^9C_7 + {}^9C_8 + {}^9C_9$$

$$= 2^9 - ({}^9C_1 + {}^9C_1)$$

$$= 512 - (1 + 9) = 502$$

30. Correct answer is [32].

$f(x) = \min(2x^2, 52 - 5x)$
 The maximum possible value of this function will be attained when $2x^2 = 52 - 5x$.

$$2x^2 + 5x - 52 = 0$$

$$(2x + 13)(x - 4) = 0$$

$$\Rightarrow x = \frac{-13}{2} \text{ or } x = 4$$

Since, x has to be positive integer, we can discard the case $x = \frac{-13}{2}$.
 $x = 4$ is the point at which the function attains the maximum value.

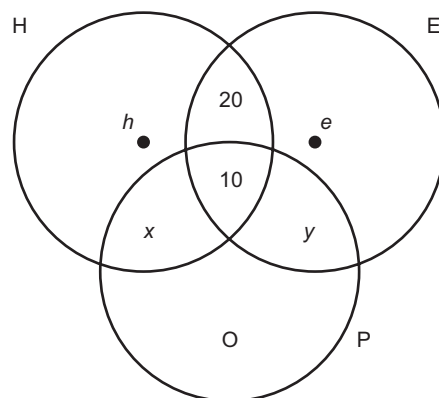
putting $x = 4$ in the original function, we get

$$2x^2 = 2 \times 4^2 = 32.$$

Or the maximum value of $f(x) = 32$

31. Correct answer is [52].

Let the number of students who studying only H be h , only E be e , only H and P but not E be x , only E and P but not H be y



Given only P = 0 All three = 10; Studying only H and E but not P = 20
 Given number of students studying H = Number of students studying E

$$= h + x + 20 + 10$$

$$= e + y + 20 + 10$$

$$h + x = e + y \text{ total number of students} = 74$$

$$\text{Therefore, } h + x + 20 + 10 + e + y = 74$$

$$h + x + e + y = 44$$

$$h + x + h + x = 44$$

$$h + x = 22$$

Therefore, the number of students studying

$$H = h + x + 20 + 10$$

$$= 22 + 20 + 10$$

$$= 52$$

32. Option (4) is correct.

Any equilateral triangle formed by joining the midpoints of the sides of another equilateral triangle will have its side equal to half the side of the second equilateral triangle.

∴ Side of $T_1 = 24$ cm side of $T_2 = 12$ cm side of $T_3 = 6$ cm and so on.

Sum of the areas of all the triangles

$$= \frac{\sqrt{3}}{4} (24^2 + 12^2 + 6^2 + \dots)$$

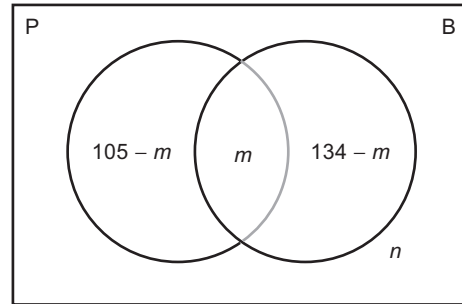
$$= \frac{\sqrt{3}}{4} \left(\frac{576}{1 - \frac{1}{4}} \right)$$

$$= 192\sqrt{3}$$

33. Option (4) is correct.

Let the number of students who like both pizza and burger be ' m '.

The number of students who like neither of them be n .



From venn diagram

$$105 - m + m + 134 - m + n = 200 \quad m - n = 39$$

∴ The possible values of (m, n) are $(39, 0)$ $(40, 1)$ $(105, 66)$

∴ The number of students who like only burger is lies in the range

$$[134 - 105, 134 - 39] = [29, 95]$$

∴ From options, the possible answer 93.

34. Option (3) is correct.

Since, $x, y,$ and z are in G.P. and $x < y < z,$ let $x = a, y = ar$ and $z = ar^2,$ where $a > 0$ and $r > 1.$

It is also given that, $5x, 16y$ and $12z$ are in A.P.

Therefore, $2 \times 16y$

$$= 5x + 12z$$

...(i)

Substituting the values of x, y and $z,$ in eq (i)

$$32ar = 5a + 12ar^2$$

$$\Rightarrow 32r = 5 + 12r^2$$

$$\Rightarrow 12r^2 - 32r + 5 = 0$$

On solving the above quadratic equation we

$$\text{get } r = \frac{1}{6} \text{ or } \frac{5}{2}.$$

Since, $r > 1,$ therefore $r = 5/2$