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AIMCAT 2016

VARC

for questions 1 to 5: The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

...Our attitude toward white-collar crime has two facets. On the one hand, it fascinates us: Why do well-paid professionals commit it — on their own, with colleagues, or as part of an organization-wide collaboration? On the other hand, it bores us: Complicated financial schemes are difficult to understand, and the perpetrators and victims are often unclear. Who suffers when a company shifts numbers around on a spreadsheet? Who's to blame when it has thousands of employees and layers of bureaucracy?

...[In] *Capital Offenses*, Samuel W. Buell, a law professor at Duke University, points out that corporate crime is all about context. [C]ases may come down to whether those accused knew their actions were illegal... He notes that the standard defense in a fraud case is not that the fraud didn't happen; it's that the fraudster didn't know he or she was breaking the law — or that, whatever the government may think, the fraudulent behaviour is business as usual in that industry. Drawing these fine lines around intention is even trickier when executives rely on expert advisers to help with their decisions. If a lawyer or an accountant tells you that something is legal — even just barely — should you have to go to jail if he's wrong?

Prosecution is especially difficult when criminal behaviour spans a whole organization ... Those high up, who bear the most responsibility for the company, may know little about its day-to-day activities. And punishing a large company — through massive fines or by sending its most senior leaders to jail — can destroy it, which has serious economic ripple effects for innocent employees, customers, and communities. There are no easy answers.

Whereas Buell's expertise is in organizational corruption and the difficulty of fighting it, *Why They Do It*, by Eugene Soltes, a professor at Harvard Business School, focuses squarely on individual perpetrators who have been caught and punished... To sum up his research, white-collar criminals rarely think about the outcomes or potential victims of their decisions... To address this striking lack of self-reflection, Soltes delves into the psychology of decision-making within organizations... [In the] modern corporation, he writes, leaders are removed from shareholders, customers, and the public. This psychological distance can cause executives to lose their way... Business school ethics courses can help, but making tough choices in the classroom is far different from facing them in the real world.

The two authors agree that we need better ways to deal with white-collar crime. Given that much of it is committed without criminal intent, Soltes says, the best solution is for executives to surround themselves with people who aren't afraid to question their decisions. On the legal side, Buell says we need greater corporate transparency and incentives for executives to act in the interests of shareholders. He also calls for better regulations but emphasises that they would help only to a point, because corporations pour money into keeping the ones that constrain them from becoming law. And, more to the point, regulations don't prevent crimes.

The real solution, Buell says, is to rethink what corruption looks like, both in business and in politics. After all, campaign contributions that influence policy are among those greedy, selfish acts that aren't illegal. Until the definition of "legal" is no longer controlled by the people or organizations with the deepest pockets, it's unlikely that real change will come about.

- Q1. Eugene Soltes' explanation for the 'striking lack of reflection' amongst white-collar criminals is that
- a) organisational corruption makes it difficult to catch and punish individual perpetrators.
 - b) perpetrators aren't compelled to think about shareholders and customers.

- c) leaders are distant from executives who are losing their way.
- d) real world challenges aren't effectively simulated in business school ethics courses.

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the sentences: '*To sum up his research, white-collar criminals rarely think about the outcomes or potential victims of their decisions... To address this striking lack of self-reflection, Soltes delves into the psychology of decision-making within organizations... [In the] modern corporation, he writes, leaders are removed from shareholders, customers, and the public. This psychological distance can cause executives to lose their way.*' The lack of self-reflection/introspection is probably because leaders and executives are far removed from the public/customers (and probably cannot see the victims).

Option A: The author here is concerned about individual perpetrators. Hence, the explanation will obviously not be reliant on organisational corruption. Also, individual introspection and organisational corruption are unrelated ideas. This option should be easily eliminated.

Option B: The perpetrators are psychologically distant from the customers and hence, do not really indulge in introspection or reflection. Those who commit white-collar crimes, do so as they are not thinking about the potential victims or the outcomes of their actions. Hence, Option B is the answer.

Option C: According to the para mentioned above, leaders and executives are not introspecting because they are removed or rather distant from their customers. It cannot be misinterpreted as the distance between leaders and their executives (as if, executives are committing mistakes because there is no one to watch over them). Hence, Option C is not the answer.

Option D: This, despite its veracity, is a partial solution suggested by the author and not the cause for the lack of introspection amongst leaders. Hence, Option D is not the answer.

Choice (B)

Q2. All of the following are ways suggested in the passage to deal with white-collar crime EXCEPT that:

- a) executives should surround themselves with people who don't always concur with their decisions.
- b) shareholder interests should be made a priority for decision-makers.
- c) policies shouldn't be influenced in any way by financial heavyweights.
- d) campaign contributions that influence policy should be regulated.

Number of words and Explanatory notes for RC:

Number of words: 555

Option A: From '*the best solution is for executives to surround themselves with people who aren't afraid to question their decisions*', we can understand that the author suggests it is important for executives to create an environment that has people who can question decisions. The author suggests the executives actively look out for such employees. Option A agrees with the author and is hence, not the answer.

Option B: From '*On the legal side, Buell says we need greater corporate transparency and incentives for executives to act in the interests of shareholders*', we can understand that the author suggests that decision-makers should consider shareholder interests as a priority and they should be incentivised/encouraged for doing the same. Option B is not the answer.

Option C: From '*Until the definition of "legal" is no longer controlled by the people or organizations with the deepest pockets*', we can understand that the author suggests keeping laws/regulations/policies out of the influence of those with deep pockets/financial heavyweights/plenty of resources. Hence, Option C is not the answer.

Option D: From the lines '*After all, campaign contributions that influence policy are among those greedy, selfish acts that aren't illegal*', we can understand that this is not a suggestion made by the author. Rather, the author is using this example to talk about how while campaign contributions aren't necessarily a good thing, they are not illegal. Hence, Option D is the answer. Choice (D)

Q3. Which of the following considerations hasn't been presented as a factor that complicates prosecutions in corporate crimes?

- a) What is fraudulent behaviour is considered acceptable in a particular industry.

- b) Those accountable have limited knowledge of happenings on the ground.
- c) Impactful punishments can encourage a chain reaction of negative consequences.
- d) Expert advice could be precarious when it comes to the fine line between legal and **illegal**.

Number of words and Explanatory notes for RC:

Number of words: 555

Option A: From the sentences '*He notes that the standard defense in a fraud case is not that the fraud didn't happen; it's that the fraudster didn't know he or she was breaking the law — or that, whatever the government may think, the fraudulent behaviour is business as usual in that industry*' it can be understood that the author is not pointing to the excuse (that fraudulent behaviour is an industry standard in some cases) as something that complicates a case. The author is suggesting it as one of the defences presented in favour of white-collar crimes. Hence, Option A is the answer.

Option B: Consider the sentences: '*Prosecution is especially difficult when criminal behaviour spans a whole organization ... Those high up, who bear the most responsibility for the company, may know little about its day-to-day activities.*' From this, it can be understood that those held responsible for decisions may not really be fully aware of what happens at a lower level. That complicates prosecution further at an organisational level. Option B is not the answer.

Option C: From '*And punishing a large company — through massive fines or by sending its most senior leaders to jail — can destroy it, which has serious economic ripple effects for innocent employees, customers, and communities*', we can understand that the impact of punishment could trickle down to several layers, adding to the prosecution complication. Therefore, Option C is not the answer.

Option D: Consider the sentences '*Drawing these fine lines around intention is even trickier when executives rely on expert advisers* to help with their decisions. If a lawyer or an accountant tells you that something is legal — even just barely — should you have to go to jail if he's wrong?' So, the author suggests that expert advisers could tell you something is barely legal, and their being wrong could push the decision towards illegal. This can complicate the case as drawing fine lines is trickier.

Choice (A)

Q4. Which of the following studies will Buell most likely approve of to further bolster his 'real solution'?

- a) A study of how executives can be encouraged to act in the interests of shareholders

- b) A study that traces how laws and regulations can be affected by lobby groups with financial clout
- c) A study that traces how campaign contributions may have subtly influenced policy in the past
- d) A study of the correlation between corporate transparency and white-collar crimes

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the sentences: '*The real solution, Buell says, is to rethink what corruption looks like, both in business and in politics.* After all, campaign contributions that influence policy are among those greedy, selfish acts that aren't illegal. Until the definition of "legal" is no longer controlled by the people or organisations with the deepest pockets, it's unlikely that real change will come about.' So, the real solution is to rethink the definition of corruption and at the same time, that definition of legal shouldn't be determined by the financially strong entities.

Option A: Executives being encouraged to protect shareholders' interests doesn't necessarily prove the case for redefining what is corruption in business and politics. Hence, Option A is not the answer.

Option B: This study proves what the author suspects – which is that what's 'legal' and what isn't is affected by those with deep pockets (financial clout – power). Hence, this study will strengthen the author's proposed solution. Option B is the answer.

Option C: This is one specific case. Even if the campaign contribution affects policy/laws/regulations, this option doesn't strengthen his real solution – which is to rethink the entire idea of corruption itself (and not just to prove that corruption exists currently in the system as proven by campaign contributions which are legal but bad). Also, it is known that campaign contributions influence policy, as per the last para. There is nothing new to prove. Hence, Option C is close but not the answer.

Option D: This study, while throwing light on what leads to white-collar crimes, doesn't solve the larger problem of rethinking the general understanding of corruption/or why executives indulge in white-collar crimes. Hence, Option D is not the answer.

Choice (B)

Q5. Soltes' 'best solution' to white-collar crime, as mentioned in the penultimate para, is most weakened by which of the following?

- a) White-collar crimes are committed by those who are well aware of the implications of their decisions.
- b) Executives aren't always driven by shareholder interests.

- c) The line between what is a white-collar crime and what isn't, confuses the smartest of executives.
- d) A majority of white-collar crimes are committed by executives who have a fine understanding of the law.

Number of words and Explanatory notes for RC:

Number of words: 555

Consider the sentences: '*Given that much of it is committed without criminal intent, Soltes says, the best solution is for executives to surround themselves with people who aren't afraid to question their decisions.*' In order to invalidate this solution, we have to prove that questioning decisions doesn't really help/has an adverse effect. This is because the author believes that white-collar crimes aren't really committed with criminal intent.

Option A: The fundamental basis for Soltes' suggesting that executives should surround themselves with those who are not afraid to question their decisions is that often crimes are not committed with criminal intent. Soltes is giving the benefit of doubt to perpetrators of white-collar crimes and therefore, believes, if they are surrounded by people who question their decisions, they may not commit transgressions. If it is known that executives understand the implications of their decisions, then they are more or less responsible for their white-collar crimes, and don't need reminders from people around them. Option A, therefore, weakens the suggestion from Soltes.

Option B: If they aren't driven by shareholder interests, they may commit white-collar crimes, as understood from Buell's suggestion for more transparency. However, this statement doesn't help us understand whether or not it is a good solution for executives to surround themselves with those who question their decisions. Hence, this option cannot weaken it.

Option C: If the line itself is confusing, then it wouldn't matter whether one is surrounded by people who question one's decisions or not. The point of having people around is so that in answering the questions raised, or in addressing those who are questioning the decisions, one is more careful when treading the line between what is legal and what isn't. Also, those who raise questions need to have a thorough understanding of what the line between legal and illegal is. Hence, this option will not weaken the suggestion.

Option D: Understanding the law is not a parameter that is a part of the solution suggested by Soltes. So, whether the executives have an understanding of the law or not wouldn't really affect the suggestion, leave alone weakening it. Hence, Option D is not the answer.

Choice (A)

DIRECTIONS for questions 6 to 10: The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

...On average, people's memories stretch no farther than age three and a half. Everything before then is a dark abyss. Psychologists have named this dramatic forgetting 'childhood amnesia'. Patricia Bauer of Emory University, a leading expert on memory development says, "[This phenomenon] demands our attention because it's a paradox: very young children show evidence of memory for events in their lives, yet as adults we have relatively few of these memories."

In the last few years, scientists have finally started to unravel precisely what is happening in the brain around the time that we forsake recollection of our earliest years... For nearly 100 years, psychologists assumed that memories of infancy did not endure because they were never durable in the first place. The late 1980s marked the beginning of a reformation in child psychology. Bauer and other psychologists began to test infant memory by performing a series of actions...and then waiting to see if a child could imitate the actions in the right order, after a delay ranging from minutes to months.

...[Experiments] revealed that the memories of children three and younger do in fact persist, albeit with limitations. [In] a landmark 1991 study, researchers discovered that four-and-a-half-year-olds could recall detailed memories from a trip to Disney World 18 months prior. Around age 6, however, children begin to forget many of these earliest memories. In a 2005 experiment by Bauer and her colleagues, five-and-a-half-year-olds remembered more than 80 percent of experiences they had at age 3, whereas seven-and-a-half-year-olds remembered less than 40 percent.

This work laid bare the contradiction at the heart of childhood amnesia: infants can create and access memories in their first few years of life, yet most of these memories eventually vanish at a rate far beyond the typical forgetting of the past we experience as adults. Maybe, some researchers thought, enduring memories require language or a sense of self, both of which we lack as infants. But although verbal communication and self-awareness undoubtedly strengthen human memories, their absence could not be the whole explanation for childhood amnesia. After all, certain animals that have large and complex brains relative to their body size — such as mice and rats — but do not have language or, presumably, our level of self-awareness, also lose the memories they make in infancy.

Perhaps, then, researchers reasoned, the paradox had a more fundamental physical basis that was common to people and other big-brained mammals. Between birth and our early teens, the brain is still laying down some of its fundamental circuitry and thickening its electrical pathways with fatty tissue to make them more conductive. In a massive surge of growth, the brain sprouts innumerable new bridges between neurons. In fact, we have far more links between brain cells in our earliest years than we end up with in adulthood; most are pruned away. All that excess brain mass is the wet clay from which our genes and experiences sculpt a brain to suit its particular environment...

This adaptability comes with a price. While the brain undergoes this prolonged development outside the womb, the large and complex network of disparate brain regions that collectively create and maintain our memories is still under construction, Bauer explains, and not as capable of forming memories as it will be in adulthood. Consequently, the long-term memories formed in our first three years of life are the least stable memories we ever make and highly prone to disintegrating as we age.

Q6. According to the passage, which of the following best reconciles the paradox mentioned in the first para?

- a) **The environment children grow up in determines which memories are retained.**
- b) **Memories which are created while the network of brain regions is still under construction are unstable.**
- c) The brain adapts to the growing requirements of adulthood by sacrificing some of the early memories.
- d) **Memories of infancy do not endure because they are never durable in the first place.**

Number of words and Explanatory notes for RC:

Number of words: 572

The paradox can be explained from this sentence: “[This phenomenon] demands our attention because it’s a paradox: very young children show evidence of memory for events in their lives, yet as adults we have relatively few of these memories”. The paradox (two contradicting events) here is that children do make memories, and yet, when we grow up, we don’t retain those memories. We have to look at the option that best explains such a paradox.

Option A: The environment children grow up in hasn’t been mentioned as a parameter as far as one’s memory is concerned. The environment determines what brain is sculpted by our genes and experiences, as mentioned in the passage. But, a direct correlation between what brain can be sculpted and what memories are retained has not been made, given all childhood memories are equally obliterated. Hence, this is an option we could eliminate.

Option B: The author’s central point is that the brain is too fluid to form permanent memories early in life. Some of these memories are lost later as understood from: ‘In fact, we have far more links between brain cells in our earliest years than we end up with in adulthood; most are pruned away. All that excess brain mass is the wet clay from which our genes and experiences sculpt a brain to suit its particular environment...’ Hence, this explains the paradox. Option B is the answer.

Option C: ‘The growing requirements of adulthood’ is an alien concept to this passage, where adulthood having different requirements hasn’t really been mentioned anywhere. Add to that, the vagueness of ‘growing’ requirements. This option hasn’t been indicated in the passage as an explanation of the paradox. Option C is not the answer.

Option D: This option merely repeats the paradox without really reconciling or resolving the paradox. Reconciliation of the paradox would include an explanation about why the memories are not durable. They don’t endure because they are not durable is more of a circular argument. Hence, Option D is not the answer.

Choice (B)

Q7. The example of mice and rats is mentioned in the antepenultimate para of the passage to demonstrate that

- a) verbal communication and self-awareness greatly strengthen human memories.
- b) animals lose memories they create in infancy for lack of language and self-awareness.
- c) enduring memories require language or a sense of self, which is missing in infants.
- d) language and sense of self do not comprehensively contribute to the endurance of memories.

Number of words and Explanatory notes for RC:

Number of words: 572

Consider the sentences: '*But although verbal communication and self-awareness undoubtedly strengthen human memories, their absence could not be the whole explanation for childhood amnesia. After all, certain animals that have large and complex brains relative to their body size—such as mice and rats—but do not have language or, presumably, our level of self-awareness, also lose the memories they make in infancy.*' The underlined portions explain why the example of mice and rats was mentioned, to show that losing memories has got nothing to do with language, or the absence of it thereof (language is absent in children and hence their memories are fragile was the original idea which the author disagrees with), since mice and rats, which do not have language, also lose memories.

Option A: The author has given the example to dissociate the stability of memories from verbal communication. Hence, this option can be eliminated.

Option B: This too is faulty causation. Animals do not have language, and animals lose memories they make in infancy. However, these two events are mentioned together not to prove that one is because of the other, but to prove that language or the lack of it has nothing to do with losing memories lost in infancy. Hence, Option B is not the answer.

Option C: This contradicts the author's main point (explained above). Endurance of memories has got nothing to do with language or sense of self. If that were the case, the same pattern we observe in humans wouldn't have been seen in mice and rats, where there is no language or sense of self (in infant rats or in grownup ones). Hence, Option C is not the answer.

Option D: This is the main purpose of mentioning the example of mice and rats – that endurance of memories or their absence is not entirely because we have language as adults but don't have it as infants. This can be understood from '*But although verbal communication and self-awareness undoubtedly strengthen human memories, their absence could not be the whole explanation for childhood amnesia.*' Hence, Option D is the answer.

Choice (D)

Q8. Bauer and other psychologists wanted to check whether a child could imitate the actions in the right order after a delay, as mentioned in the second para, to test

- a) how long memories created in infancy would last.
- b) whether memories of infancy were detailed enough.
- c) whether memories are formed during infancy.
- d) the transience of memories created in infancy.

Number of words and Explanatory notes for RC:

Number of words: 572

The experiment was to prove that children do create memories. Only when children make memories, can they imitate the order. Consider the sentences: '*Bauer and other psychologists began to test infant memory by performing a series of actions...and then waiting to see if a child could imitate the actions in the right order, after a delay ranging from minutes to months....[Experiments] revealed that the memories of children three and younger do in fact persist*, albeit with limitations.'

Option A: The experiments were not to test how long the memories last. Because the conclusion was 'memories in fact persist', meaning that they make stable memories. Hence, Option A is not the answer.

Option B: The amount of detail in the memories they endure is not really the objective of the experiments here. The next set of experiments did record that detailed memories are made by infants, but 'detail of the memory' is not a focus-point here. Hence, Option B is not the answer.

Option C: It is not whether memories are formed, but whether memories persist which is being discussed in the passage. Hence, Option C is not the answer.

Option D: The conclusion of the psychologists was with respect to whether memories persist (as opposed to not being made at all, or being made but disappearing soon). That's why the increasing duration for which memories are held is crucial. So, the time durations suggest that long-term memories are in fact created, but somehow, they do not endure beyond a certain age. Hence, Option D is the answer. Choice (D)

Q9. The disadvantage of the 'wet clay from which our genes and experiences sculpt a brain' is that

- a) it turns the brain into a large and complex network of disparate regions.
- b) it is highly conducive to forming new memories, thus erasing older ones.
- c) it destabilises the memories we create in our infancy.
- d) fundamental circuitry between our brain cells is pruned away in adulthood.

Number of words and Explanatory notes for RC:

Number of words: 572

This is an analogy where just like wet clay can be moulded to make new shapes with the same content/raw material, the circuitry of the brain can be moulded, thus erasing old memories before new and more persistent memories are formed. The disadvantage is mentioned here: '*This adaptability comes with a price. While the brain undergoes this prolonged development outside the womb, the large and complex network of disparate brain regions that collectively create and maintain our memories is still under construction, Bauer explains, and not as capable of forming memories as it will be in adulthood.* Consequently, the long-term memories formed in our first three years of life are the least stable memories we ever make and highly prone to disintegrating as we age.'

Option A: The complex network of disparate regions that the brain may or may not become is not really the disadvantage or the price we may pay. The price we pay is that the memories made during the first three years of life are unstable and prone to disintegrating. Option A is not the answer.

Option B: The older ones are not erased because the brain is constantly forming new ones. In other words, it is not time/chronological order that constantly churns or refreshes memories. Memories are stable beyond a certain point. So, the wet clay is conducive to rewiring of the circuitry, not so much to making new memories. That causation is inaccurate. Hence, Option B is not the answer.

Option C: This according to the author is the price we pay – the disintegration of memories made during childhood, once the brain circuitry changes. Hence, Option C is the answer.

Option D: While this may be true and mentioned in the passage, it doesn't explain the comparison with 'wet clay', which can easily be moulded. Hence, Option D is not the answer.

Choice (C)

Q10. Which of the following offers an alternative explanation as to why humans don't recollect childhood memories?

- a) the brain constantly disintegrates to make way for new memories.
- b) the body cannot expend enough resources during childhood to form neural circuitry required for forming long-lasting memories.
- c) frequently accessed memories endure longer than those that aren't retrieved for more than a few weeks.
- d) the fundamental circuitry of the brain is laid and re-laid well beyond the teenage years.

Number of words and Explanatory notes for RC:

Number of words: 572

The theory the author discusses in the passage can be summarised in two parts:

- (1) *This work laid bare the contradiction at the heart of childhood amnesia: Infants can create and access memories in their first few years of life, yet most of these memories eventually vanish at a rate far beyond the typical forgetting of the past we experience as adults.*
- (2) *The long-term memories formed in our first three years of life are the least stable memories we ever make and highly prone to disintegrating as we age. This is because the fundamental circuitry in the brain is still under construction.*

Option A: This explanation takes age out of consideration and explains that memories constantly disintegrate (unlike the author's explanation which explains why only childhood memories disintegrate). Hence, Option A is not a good alternative explanation. Option A is not the answer.

Option B: This explains why memories aren't stored for a long period of time during childhood, while they are in adults. This provides an alternative explanation to the observations made by the author. Hence, Option B is the answer.

Option C: According to this option, it is not construction of the brain's fundamental circuitry or pathways but accessing memories which influences what memories persist and what don't. This doesn't provide an alternative explanation as it takes age out of the equation, and hence doesn't explain why it is seen in children while adults do make memories that last much longer. Hence, Option C is not the answer.

Option D: This goes against the author's suggestion that this happens only once very early in one's life, which is why long-term memories in the first three years of life are not stable. Even if Option D is true, it doesn't provide an alternative explanation to what the author has observed and tried to explain. Hence, Option D is not the answer.

Choice (B)

DIRECTIONS for questions 11 to 15: The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

Corals [sensitive to temperature fluctuations] are suffering today from ocean acidification, over-fishing, coastal development and agricultural runoff. Their biggest killer is warming sea-water.

The coral polyps are "a consortium of organisms". The microscopic algae and bacteria (the main food sources for corals) living in coral tissue are sensitive to small temperature changes. When stressed by heat, these symbionts start producing dangerous oxidants. This causes the polyps to eject them, to ensure short-term survival. The reef turns ghostly white [process is termed

'bleaching']. Bleached coral is not dead. But unless temperatures drop, the polyps will not readmit the algae and bacteria, and so they die.

Polyps surviving one such ordeal will fare better if temperatures rise again. The second time around, they have acclimatised ...and pass this resilience onto their offspring via intergenerational epigenesis.

One approach to save corals is to lower reef temperatures directly. But colder water can absorb more CO₂, is more acidic and can damage reefs. ...An entirely different approach is needed. If oceans are changing faster than corals can adapt via the normal processes of evolution, why not, researchers argue, work out ways to speed up such evolution?

Most species of coral spawn on just two nights a year. The sperm and eggs released during spawning unite, and form larvae that search for places to settle down and metamorphose into the stone-encased sea-anemone-like polyps (adult form). In the wild, meeting of sperm and egg is random. Some researchers, however, are trying to load the dice.

Dr Christian Voolstra [Red Sea Research Center, Saudi Arabia] describes the effort as "making sure wild [coral] specimens of super mama and super papa (which survived a period of heat that killed others) meet and reproduce". ...

The Australian Institute of Marine Science (AIMS, Queensland) crossbreeds corals from different places, to create hybrid vigour. Results of such crosses are unpredictable, but some survive heat greater than either of their parents.

The artificial breeding of corals is constrained by their cyclical breeding habits, so researchers are speeding the process up by staggering lighting and temperature patterns to fool the animals into releasing their gametes on any day. This also permits the co-mingling of sperm and eggs that would not normally meet, allowing new varieties [heat resistant] to be created.

Scientists at AIMS are also producing algae that withstand higher temperatures without releasing the oxidants that lead coral to kick them out, a process termed "directed laboratory evolution". Madeleine van Oppen's team has grown eighty algal generations, repeatedly culling those organisms most susceptible to heat stress and ocean acidification. The resulting algae release fewer toxins and photosynthesise better in warm water than do their wild brethren.

Unfortunately, Dr van Oppen's super-algae lose their newfound prowess once they colonise a coral. When [her] team began injecting these super-algae into the tiny, tentacle-encircled mouths of polyps, they found that the polyps seemed to benefit little from this artificial inoculation. ...

Researchers are also determining which genes are behind a coral's, alga's or bacterium's fragility or resilience. Stephen Palumbi [Stanford University] is identifying coral genes that produce the "heat-shock" proteins (which repair damage caused by excess warmth). ...Editing the corals' heat thresholds (for greater robustness) is in progress.

Some scientists have rightly suggested that supercorals will accelerate the process of refreshing reefs. Supercorals, they think, would not need to be placed on reefs in astronomical numbers. If supercorals are truly fit for purpose they will necessarily multiply more rapidly than wild varieties do in the warmer, more acidic seas of the future. Yet these people should not miss a historian's point that "what we obtain quickly or providentially, we esteem too lightly." For the far-ranging benefits of the scientists' efforts to be achieved, one should focus on reducing carbon-dioxide emissions and make sure that corals bred to survive warming seas do not suffer handicapping trade-offs.

Q11. The primary purpose of the author in the passage is to

- a) **outline the effects of climate change on corals.**
- b) **reconcile conflicting viewpoints regarding the possibility of reviving the coral reefs.**
- c) weigh the ethics of using strategies for accelerating the evolution of the corals.
- d) **discuss ways of creating hardier varieties of corals.**

Number of words and Explanatory notes for RC:

Number of words: 638

Option A: Option A is indirectly limited to the first para of the passage only. It is not the correct answer. Corals are sensitive to temperature fluctuations. They are suffering from ocean acidification, over-fishing, coastal development and agricultural runoff. But their biggest killer is warming sea-water. Option A is not the central focus of the author of the passage as it leaves out research findings done with an attempt to work out ways to speed up the evolution of corals to withstand rising ocean temperatures.

Option B: There are no conflicting viewpoints regarding the possibility of reviving the coral reefs discussed in the passage. So the question of reconciling the same does not arise. Option B is not the answer.

Option C: **So an entirely different approach is needed. If oceans are changing faster than corals can adapt via the normal processes of evolution, why not, researchers argue, work out ways to speed up such evolution?** But the passage does not discuss ethics. Hence option C is not the answer. When referring to the historian's quotation in the last para, the author is only ending the passage on a note of caution: In order for the far ranging benefits of the scientists' efforts to be achieved, one should focus on reducing carbon-dioxide emissions and make sure that corals bred to survive warming seas do not suffer handicapping trade-offs. Nowhere is he against the research done to accelerate the evolution of the corals or to create tougher varieties of corals.

Option D: **So an entirely different approach is needed. If oceans are changing faster than corals can adapt via the normal processes of evolution, why not, researchers argue, work out ways to speed up such evolution?** Numerous examples of research efforts from different places have been cited with this objective in mind. (Dr Christian Voolstra is "making sure wild specimens of super mama and super papa (which survived a period of heat that killed their neighbours) meet and reproduce". The Australian Institute of Marine Science (AIMS) in Queensland, is crossbreeding corals from different places, to create hybrid vigour. Scientists at AIMS are producing algae that withstand higher temperatures without releasing the oxidants that lead coral to kick them out, a process termed "directed laboratory evolution". Madeleine van Oppen's team has grown 80 generations of algae, repeatedly culling those organisms most susceptible to heat stress and ocean acidification. Researchers are also determining which genes are behind a coral's, alga's or bacterium's fragility or resilience. etc etc). This make option D the overarching objective or primary concern of the author of this passage. Hence option D is the correct answer. Choice (D)

Q12. Which of the following is not a scientific effort undertaken by scientists for the survival of corals?

- a) Ensuring certain resilient species of coral meet and reproduce
- b) Directed laboratory evolution
- c) Intergenerational epigenesis
- d) Studying the genes affecting the heat resistance of corals

Number of words and Explanatory notes for RC:

Number of words: 638

Option A: In the wild, the meeting of sperm and egg is random. Some researchers, however, are trying to load the dice. Dr Christian Voolstra [Red Sea Research Center, Saudi Arabia] describes the effort as "making sure wild specimens of super mama and super papa (which survived a period of heat that killed their neighbours) meet and reproduce". An approach, taken by the Australian Institute of Marine Science (AIMS) in Queensland, is to crossbreed corals from different places, to create hybrid vigour. So the method mentioned in this option has been undertaken by scientists to create tougher varieties of corals. Option A is true and is not the answer.

Option B: The artificial breeding of corals is constrained by their cyclical breeding habits, so researchers are speeding the process up... This also permits the co-mingling of sperm and eggs that would not normally meet, allowing new varieties [heat resistant] to be created. Scientists at AIMS are producing algae that withstand higher temperatures without releasing the oxidants that lead coral to kick them out, a process termed "directed laboratory evolution". Madeleine van Oppen's team has grown more than 80 generations of algae, repeatedly culling those organisms most susceptible to heat stress and ocean acidification.

Option B is true and is not the answer.

Option C: Choice C is not a scientific effort undertaken by scientists. It points to an innate trait or feature of the corals themselves. Polyps surviving one such ordeal will fare better if temperatures rise again. They have acclimatised and can pass this resilience onto their offspring via intergenerational epigenesis. So Intergenerational epigenesis is a characteristic of the coral polyps themselves. Option C is the required answer.

Option D: Refer to the penultimate para. Researchers are also determining which genes are behind a coral's, alga's or bacterium's fragility or resilience. Stephen Palumbi [Stanford University] is identifying coral genes that produce the "heat-shock" proteins (which repair damage caused by excess warmth). Editing the corals' heat thresholds (for greater robustness) is in progress. This indicates that the approach mentioned in this option is undertaken by scientists to create tougher varieties of corals. Hence option D is also true and is not the answer. Choice (C)

Q13. Which of the following invalidates the problem associated with the super-algae in Dr Madeleine van Oppen's research?

- a) A paleoclimatology study that shows that lowering reef temperatures will help the coral polyp sink to the seabed and get transformed into coral rocks.
- b) An *in vivo* study showing that super-algae retain their characteristics when reintroduced in polyps that underwent bleaching.
- c) A marine biology study which proves that 90% of global warming in the past 50 years had occurred in the ocean resulting in a decline of coral reef biodiversity.

d) An ecology study showing that near death experiences cause super-algae to possess greater heat tolerance and reduced photosynthesising ability but they are readmitted by polyps.

Number of words and Explanatory notes for RC:

Number of words: 638

Madeleine van Oppen's team has grown eighty generations of algae, repeatedly culling those organisms most susceptible to heat stress and ocean acidification. The resulting algae release fewer toxins and photosynthesise better in warm water than do their wild brethren.

Unfortunately, Dr van Oppen's **super-algae lose their newfound prowess once they colonise a coral**. When [her] team began injecting those algae into the tiny, tentacle-encircled mouths of polyps, they found that **the polyps seemed to benefit little from this artificial inoculation...**

Option A: One approach to save corals is to lower reef temperatures directly. But colder water can absorb more CO₂, is more acidic and can damage reefs. So an entirely different approach is needed. Hence, lowering sea temperatures is not a good enough method to save the corals. Even so, option A does not invalidate the specific problem associated with the super-algae in Dr Madeleine van Oppen's research.

Option B: When stressed by heat, the symbionts (algae and bacteria living in coral tissue) start producing dangerous oxidants. This causes the polyps to eject them, to ensure short-term survival. The reef turns ghostly white [process is termed 'bleaching']. Bleached coral is not dead. But unless temperatures drops, the polyps will not readmit the algae and bacteria, and so they die. Scientists at AIMS are producing algae that withstand higher temperatures without releasing the oxidants that lead coral to kick them out, a process termed "directed laboratory evolution".

...Unfortunately, Dr van Oppen's super-algae lose their newfound prowess once they colonise a coral. When [her] team began injecting those algae into the tiny, tentacle-encircled mouths of polyps, they found that the polyps seemed to benefit little from this artificial inoculation... ...So, a study such as the one given in option B can help a scientist deal with the specific problem and it can lead to additional steps such as bleaching corals artificially and then planting such "stress hardened" polyps on wild reefs in the near future. Hence choice B is the correct answer.

Option C: Option C is negative in tone. It increases the worry of a scientist who is interested in saving the coral reefs. Option C reiterates the causes of coral reef damage and decay and does nothing to invalidate the problem associated with the super-algae in Dr Madeleine van Oppen's research.

Option D: If after a near death experience, polyps readmit the algae having greater heat tolerance levels, then it would be great. But the microscopic algae and bacteria living in coral tissue are the main food sources for corals. So, if the readmitted algae now have reduced photosynthesising ability, then these symbionts will not be able to sustain themselves and the coral species. Hence option D is not as good a study or finding as option B.

Choice (B)

Q14. The author attributes the term "consortium of organisms" to a coral polyp most likely to

a) provide an example of a characteristic sign of coral reef deterioration.

- b) explain how coral reefs produce food for themselves and other members of coral reef communities.
- c) assert that they are able to survive inspite of an overabundance of algae that have been ejected by the polyps into the surrounding waters.
- d) highlight that a polyp's fate is tied closely to the algae and bacteria which live in its tissue.

Number of words and Explanatory notes for RC:

Number of words: 638

This question concerns why the author has included a particular detail. Refer to the second para. The coral polyps are "a consortium of organisms".

Option A: The second para does talk about how the microscopic algae and bacteria living in coral tissue die, when they are not readmitted by the polyp which ejected them out at higher temperature. However, the term "consortium of organisms" points to a symbiotic relationship between the coral polyp, the algae and the bacteria that form an ecological system. It does not serve to solely exemplify the deterioration of the coral reef. Hence option A is not the answer. We can say that the author includes the term "consortium of organisms" in the context of a symbiotic process of coral reefs and not in the context of decline of coral reefs.

Option B: The microscopic algae and bacteria living in coral tissue are the main food sources for corals. "food for other members of coral reef communities" has not been discussed. Option B is incomplete and leaves out the more important details about how the symbiotic relationship between the symbionts of a coral species is threatened due to high temperatures of the oceans. So option B is not the correct answer.

Option C: "overabundance of algae" has not been mentioned as a threat to coral reefs. So option C is out of scope. The passage only tells us that algae have been ejected by the polyps into the surrounding waters when the temperature rises, and when not readmitted by the polyps, the algae die.

Option D: When stressed by heat, the symbionts (microscopic algae and bacteria) start producing dangerous oxidants. This causes the polyps to eject them, to ensure short-term survival. The reef turns ghostly white [process is termed 'bleaching']. Unless temperatures drops, the polyps will not readmit the algae and bacteria, and so they die. We can infer that the author uses the term "consortium of organisms" to highlight that a polyp's fate is linked with the algae and bacteria which live in its tissue. Hence option D is the correct answer.

Choice (D)

Q15. Each of the following options contains a quote / phrase taken from the passage and its implication as can be understood from the context of the passage.

Which of the following correctly matches the quote / phrase with its implication?

- a) "some researchers are trying to load the dice" (para 5) – an indicator of how scientists could breed heat resistance into the offspring by starting with wild coral specimens that possess desired traits
- b) "some researchers are trying to load the dice" (para 5) – an explanation of how scientists are tinkering with nature, speeding up evolution and narrowing diversity
- c) "what we obtain quickly or providentially, we esteem too lightly" (last para) – a paradoxical statement highlighting the controversy in the methodology of introducing supercorals in the wild
- d) "what we obtain quickly or providentially, we esteem too lightly" (last para) – an accusation against the author by the opponents of his viewpoint

Number of words and Explanatory notes for RC:

Number of words: 638

Option A: Refer to several parts of the passage. "In the wild, meeting of sperm and egg is random. Some researchers, however, are trying to load the dice. Dr Christian Voolstra [Red Sea Research Center, Saudi Arabia] describes the effort as "making sure wild [coral] specimens of super mama and super papa (which survived a period of heat that killed others) meet and reproduce". ... Researchers are speeding the process up by staggering lighting and temperature patterns to fool the animals into releasing their gametes on any day. This also permits the co-mingling of sperm and eggs that would not normally meet, allowing new varieties [heat resistant] to be created. The passage goes on to discuss other techniques such as "directed laboratory evolution". From these lines, we can infer that scientists aim to selectively breed heat resistance into offspring by starting with wild coral specimens that had the desired characteristics. Hence option A is the correct implication of the sentence given in quote. Option A is the correct answer.

Option B: If oceans are changing faster than corals can adapt via the normal processes of evolution, why not, researchers argue, work out ways to speed up such evolution?... Researchers are speeding up the process of evolution of the coral species as explained in option A. However, the author of the passage does not accuse scientists of tinkering with nature and narrowing diversity. Hence option B is extreme and is not the answer.

Option C: The historian's quotation offers a note of caution or slight contradiction to the view voiced/ hope expressed in the preceding sentence. Some scientists think that the supercorals (bred through the techniques discussed in the passage) will necessarily multiply more rapidly than wild varieties do in the warmer, more acidic seas of the future. The scientists are dependent on the hope that speeding up the evolution of the corals to exhibit certain features, such as greater heat tolerance, is one way of dealing with coral reef deterioration. The scientists need to go several steps ahead. One should focus on reducing carbon-dioxide emissions and make sure that corals bred to survive warming seas do not suffer handicapping trade-offs. The author agrees that a viewpoint (of the scientists) is ill advised but does not say that it is controversial. Hence option C is not the answer.

Option D: Option D is not the correct answer. The author agrees with the historian as is evident in the final sentence of the passage. There are no opponents of the viewpoint of the author as such. The quotation was not used to strengthen or support the opponents of the viewpoint of the author or paint them in a positive light.

Choice (A)

DIRECTIONS for questions 16 to 20: The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

Liberalism's great advantage over other ideologies is that it is flexible and undogmatic. It can sustain criticism better than any other social order... Liberalism has already survived three big crises – the first world war, the fascist challenge in the 1930s, and the communist challenge in the 1950s-70s.

...So, we hope liberalism can reinvent itself yet again. But the main challenge it faces today comes not from fascism or communism, or the demagogues and autocrats that are spreading everywhere like frogs after the rains. This time the main challenge emerges from the laboratories. Liberalism is

founded on the belief in human liberty. Unlike rats and monkeys, human beings are supposed to have “free will”. This is what makes human feelings and human choices the ultimate moral and political authority in the world...

Unfortunately, “free will” isn’t a scientific reality...Humans certainly have a will – but it isn’t free. Humans make choices – but they are never independent choices. Every choice depends on a lot of biological, social and personal conditions that you cannot determine for yourself. I can choose what to eat...and whom to vote for, but these choices are determined in part by my genes, my biochemistry, my gender, my family background, my national culture, etc – and I didn’t choose which genes or family to have.

But now the belief in “free will” suddenly becomes dangerous. If governments and corporations succeed in hacking the human animal, the easiest people to manipulate will be those who believe in free will...To successfully hack humans, you need two things: a good understanding of biology, and a lot of computing power. [S]oon, corporations and governments might have both, and once they can hack you, they can not only predict your choices, but also reengineer your feelings.

Propaganda and manipulation are nothing new. But whereas in the past they worked like carpet bombing, now they are becoming precision-guided munitions...In recent years, some of the smartest people in the world have worked on hacking the human brain to make you click on ads... Now these methods are being used to sell you politicians and ideologies, too.

... [W]ithin a few years biometric sensors could give hackers direct access to your inner world, and they could observe what’s going on inside your heart...the muscular pump that regulates your blood pressure and much of your brain activity. The hackers could then correlate your heart rate with your credit card data, and your blood pressure with your search history...

... [To] survive... we need to ... come to terms with what humans really are: hackable animals...Greek mythology tells that Zeus and Poseidon competed for the hand of the goddess Thetis. But when they heard the prophecy that Thetis would bear a son more powerful than his father, both withdrew in alarm. Since gods plan on sticking around forever, they don’t want a more powerful offspring to compete with them. So, Thetis married a mortal, King Peleus, and gave birth to Achilles. Mortals do like their children to outshine them. This myth might teach us something important. Autocrats who plan to rule in perpetuity don’t like to encourage the birth of ideas that

might displace them. But liberal democracies inspire the creation of new visions, even at the price of questioning their own foundations.

Q16. The mention of 'laboratories' in the second para of the passage:

- a) is an accurate representation of the way liberalism has evolved in the last few decades.
- b) is a metaphor for the experiments conducted by the government to eliminate liberalism in society.
- c) is a reminder of the efforts undertaken to use a liberal's belief in free will against him/her.
- d) is an example of the consequences of government propaganda and manipulation.

Number of words and Explanatory notes for RC:

Number of words: 543

Consider the sentence: *But the main challenge it faces today comes not from fascism or communism, or the demagogues and autocrats that are spreading everywhere like frogs after the rains. This time the main challenge emerges from the laboratories. This is further explained in 'But now the belief in "free will" suddenly becomes dangerous. If governments and corporations succeed in hacking the human animal, the easiest people to manipulate will be those who believe in free will.'* So, we can understand that the laboratories are representations of places that are experimenting or trying to 'hack the human animal.'

Option A: The laboratories represent a danger (negative) and not evolution (positive). Hence, Option A should be eliminated easily.

Option B: The experiments are not to eliminate liberalism. Rather, the experiments are to manipulate those who believe in liberalism to do the bidding of organisations and governments while falsely believing that they are acting out of their own free will. Hence, Option B is inaccurate.

Option C: The laboratories signify ongoing efforts by governments and corporations to hack the human brain. By doing so, they will manage to make an individual take decisions which are conducive to them while believing he or she is acting out of free will (not knowing they have been hacked into taking those decisions). Hence, Option C is the answer.

Option D: The laboratories represent the danger to free-will and liberalism. The laboratories are not a consequence of the government propaganda. The laboratories may be used by the government to further their cause and manipulate individuals. They are a more a medium than a consequence. Hence, Option D is not the answer.

Choice (C)

Q17. Which of the following statements, if true, nullifies the biggest danger facing liberalism?

- a) The decision-making rationale of those who believe in free will is too unpredictable to be engineered to respond to specific stimuli.
- b) The free will of an individual cannot be hacked with the help of biometric sensors.
- c) Human choices are a function of biological, social and personal conditions.
- d) Free will of individuals cannot be manipulated easily.

Number of words and Explanatory notes for RC:

Number of words: 543

The biggest danger facing liberalism, according to the author, is that humans are hackable, and their own free will could be manipulated by corporations and governments.

Option A: If the decision-making rationale cannot be reengineered to respond to stimuli, it means they cannot be hacked or manipulated into believing that they are acting out of their own free will. This goes against the grain of the danger that the author is concerned about, since the danger is that they can be hacked and made to believe that they are acting of their own free will, when in reality they are not. Option A is the answer.

Option B: Even if this is true, there could be other ways of hacking the free will of an individual (the author mentions that biometric sensors could be used to hack/condition individuals by understanding them better). Hence, this option doesn't nullify the real concern that the free will of individuals can be hacked. Option B is not the answer.

Option C: This option doesn't shed light on/strengthen/weaken the author's main concern that individuals can be hacked and manipulated. Hence, Option C is not the answer.

Option D: The concern of the author that free will maybe manipulated by corporations and governments is not nullified, just because it is difficult. Even if it is difficult, it leaves the possibility, the danger the author is anxious about. Hence, Option D is not the answer.

Choice (A)

Q18. The author uses the example of Greek mythology in the last para of the passage:

- a) to demonstrate that mortals find joy in the success of their children.
- b) as an analogy to depict the danger facing liberal democracies.
- c) to prove that Zeus and Poseidon were egomaniacal.

- d) to show that liberalism is a mortal ideology that comes with an expiry date.

Number of words and Explanatory notes for RC:

Number of words: 543

Consider the sentences: 'Greek mythology tells that Zeus and Poseidon competed for the hand of the goddess Thetis... This myth might teach us something important. Autocrats who plan to rule in perpetuity don't like to encourage the birth of ideas that might displace them. But liberal democracies inspire the creation of new visions, even at the price of questioning their own foundations.' The author compares gods like Zeus and Poseidon with autocrats – those who want power forever. Mortals on the other hand have been compared to liberal democracies which allow newer visions to replace the older ones.

Option A: While this option feels likely, it is important to remember that the analogy was given not to talk about mortals or gods. The idea has more to do with ideologies and liberalism, in particular. Hence, Option A is not the answer.

Option B: This option brings home the point that the author has been trying to make through the passage – that liberalism is under threat, thanks to the ongoing efforts to hack the human brain. Hence, Option B is the answer.

Option C: The characteristics of Zeus and Poseidon weren't the discussion points here. They are used for the analogy to explain something bigger, a higher idea. Hence, this option can easily be eliminated.

Option D: This is negative, while the author's intention was to demonstrate that liberal democracies allow for newer visions to grow (in a positive way). Hence, this is not the answer.

Choice (B)

Q19. Propaganda and manipulation have become 'precision-guided munitions' now, unlike the case earlier, because they are used

- a) to broadcast ads that target millions of individuals at the same time.
- b) to sell powerful ideologies instead of products.
- c) by governments who have access to greater computing power.
- d) to hack into an individual's brain and reengineer his or her feelings.

Number of words and Explanatory notes for RC:

Number of words: 543

Option A: The author uses the expression precision-guided munition to focus on the fact that individuals can now be targeted directly, and can be manipulated based on the information available about them. Hence, this option, which talks about broadcasting to large numbers misses the point. Option A is not the answer.

Option B: This option talks about one of the ways in which precision-guided munitions may be used. However, product or ideology is irrelevant here as the question is more about why the propaganda has become precision-guided munition. That has not been answered. Hence, Option B is not the answer.

Option C: Precision-guided munitions are not used because governments have greater computing power. It has become possible because of the technology/or may become possible because of technology. However, that isn't the reason why propaganda has become precision-guided munition. The cause behind the author using the expression hasn't been mentioned. Hence, Option C is not the answer.

Option D: Propaganda has become 'precision-guided munition' because it is targeted against specific individuals and manipulates them to believe they are acting of their own free will, when, clearly, they aren't. Hence, Option D is the answer.

Choice (D)

Q20. The author is least likely to agree with which of the following?

- a) Human feelings and human choices are the ultimate moral and political authority in the world.
- b) A person's belief in 'free will' can be misused by those selling ideologies.
- c) Those who believe in liberalism may be in denial of its vulnerabilities.
- d) Human choices are independent of free will.

Number of words and Explanatory notes for RC:

Number of words: 543

Option A: The author will not agree with this statement, since the basis on which human choices are the ultimate moral authority – the free will – is according to the author untrue. This can be understood from: '*Unlike rats and monkeys, human beings are supposed to have "free will". This is what makes human feelings and human choices the ultimate moral and political authority in the world... Unfortunately, "free will" isn't a scientific reality... Humans certainly have a will – but it isn't free.*' So, the author negates the idea that human feelings and human choices can be the moral authority. Option A is the answer.

Option B: Consider the sentences: '*In recent years some of the smartest people in the world have worked on hacking the human brain to make you click on ads... Now these methods are being used to sell you politicians and ideologies, too.*' From this, we can understand that the author will agree with the statement that an individual's belief in free will can be misused by those who want to sell ideologies, because such individuals can be manipulated easily. Option B is not the answer.

Option C: The author suggests '[To] survive... we need to ... come to terms with what humans really are: hackable animals'. From this, we can understand that the author believes that those who believe in liberalism do not yet fully know of its danger – that humans can be hacked. Hence, the author will agree with this statement.

Option D: Consider the sentences: 'Humans make choices – but they are never independent choices. Every choice depends on a lot of biological, social and personal conditions that you cannot determine for yourself. I can choose what to eat...and whom to vote for, but these choices are determined in part by my genes, my biochemistry, my gender, my family background, my national culture, etc – and didn't choose which genes or family to have.' The author believes humans do not have free will. In fact, their choices are never independent and are always guided by biological, personal and social conditions. So, we can say that the author believes the choices humans make don't involve (independent of) free will.

Choice (A)

Q21. DIRECTIONS for questions 21 to 24: Each of the following questions has a set of five sequentially ordered statements. Classify the statements into Facts, Inferences and Judgements based on the following criteria:

- Facts, which deal with pieces of information that one has seen, heard or read; which are known matters of direct observation or existing reality; which are open to discovery or verification (the answer option indicates such a statement with an 'F')
- Inferences, which are logical conclusions or deductions drawn about the unknown, on the basis of the known i.e. based on the knowledge of facts (the answer option indicates such a statement with an 'I')

- Judgments, which are opinions or predictions or recommendations or estimates or anticipations of common sense or intention that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future (the answer option indicates such a statement with a 'J')

Select the answer option that best describes the set of statements.

1. From behind the wheel of a self-driving electric Tesla model S, gliding amid the forests and fjords of Norway, the future of the planet might look pretty good.
2. It almost feels as if you are in the midst of a monumental transition – you are on the road, hands-free, to a post-fossil-fuel future.
3. Virtually all of Norway's electricity is emissions-free: it comes from hydropower delivered by cascading waterfalls, dams and rivers that run so close to the roads that you can almost run your fingers through them.
4. The fact remains that there are so many fast-charging stations that you will likely not get stranded and Teslas have become so run-of-the-mill in Oslo that it will not be unusual to see them spattered with mud, their seats matted with dog hair.
5. Cars powered by hydrogen fuel cells have now started to appear on Norway's streets.

a) IJJFF

b) JIFFI

c) JJIJF

d) JJFJF

Sentence 1: This is an opinion which can neither be verified, nor can be understood from another source statement. "The future might look pretty good" is a prediction, a personal opinion, a subjective statement. Hence, it is a Judgment – J.

Sentence 2: Sentence 2 also provides a personal opinion: It almost feels as if you are.... 'monumental' is an adjective and 'monumental transition' is a descriptive phrase which is not factual in tone. Also "you are on the road, hands-free, to a post-fossil-fuel future" is an opinionated comparison. So, it is a Judgment – J.

Sentence 3: Sentence 3 is an inference. It indicates that this is how the writer interprets the situation. "All of Norway's electricity is emissions-free" is a conclusion that can be drawn from the information provided: It comes from hydropower delivered by cascading waterfalls, dams and rivers... Sentence 3 is not a judgment. The only bit that indicates an opinion here is the adverb 'virtually' and the descriptive part "you can almost run your fingers through them". Remove these parts and you have an inference. Put these back, and, opinion notwithstanding, the intention of the sentence is still to draw a conclusion. So, Inference – I.

Sentence 4: In sentence 4, we're not to be distracted by the use of 'the fact remains'. What the author is offering is a statement about the future in the manner of a conclusion. So, either I or J. Considering that he says 'you will likely not get stranded' and 'it will not be unusual to see them', he's sticking his neck out a bit with respect to his personal opinion (so many fast-charging stations, so run-of-the-mill in Oslo). So, this statement is a Judgment – J.

Sentence 5: Sentence 5 provides verifiable information i.e. it is factual in tone. Hence, Choice (C)

Q22. DIRECTIONS for questions 21 to 24: Each of the following questions has a set of five sequentially ordered statements. Classify the statements into Facts, Inferences and Judgements based on the following criteria:

- Facts, which deal with pieces of information that one has seen, heard or read; which are known matters of direct observation or existing reality; which are open to discovery or verification (the answer option indicates such a statement with an 'F')
- Inferences, which are logical conclusions or deductions drawn about the unknown, on the basis of the known i.e. based on the knowledge of facts (the answer option indicates such a statement with an 'I')
- Judgments, which are opinions or predictions or recommendations or estimates or anticipations of common sense or intention that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future (the answer option indicates such a statement with a 'J')

Select the answer option that best describes the set of statements.

1. Leadership is a quality that is hard to define, but as a Supreme Court justice said of obscenity, you know it when you see it.
2. Everyone can think of inspiring leaders from history but managers who think they can base their style on Nelson Mandela or Elizabeth I are suffering from delusions of grandeur.
3. I believe that the biggest mistake is to equate leadership entirely with charisma: charisma plus egomania minus competence is a dangerous formula.
4. As shown by the Netflix documentary, "Fyre: The Greatest Party That Never Happened", Billy McFarland was just 25 when he set up the Fyre festival which promised attendees a luxury experience on a deserted island in the Bahamas.
5. Mr McFarland was a preternatural salesman, convincing investors that being an entrepreneur, he can persuade talented young people to work for him.

a) **JJJFJ**

b) **JIFFI**

c) **FJJIJ**

d) **JJJFI**

Sentence 1: Even though there is a reference to what the Supreme Court justice said of obscenity, the author is giving us his impression of leadership. So sentence 1 is a judgment – J.

Sentence 2: Sentence 2 is a judgment as it provides subjective opinion with the help of examples: Everyone can think of, inspiring managers who think they can base their style... Sentence 2 is a judgment – J.

Sentence 3: Sentence 3 is a judgment. It mentions the author's personal opinion: I believe that Note the use of adverbs ("entirely") and adjectives ("biggest", "dangerous"). So, Judgment – J.

Sentence 4: Sentence 4 is a fact. We can verify the information provided about Billy McFarland from the mentioned source. Hence Fact – F.

Sentence 5: Sentence 5 is an inference. The evidence "convincing investors that being an entrepreneur, he can persuade talented young people to work for him" helps the author conclude that he was a preternatural salesman. So, Inference – I.

Hence, **JJJFI**.

Choice (D)

Q23. DIRECTIONS for questions 21 to 24: Each of the following questions has a set of five sequentially ordered statements. Classify the statements into Facts, Inferences and Judgements based on the following criteria:

- Facts, which deal with pieces of information that one has seen, heard or read; which are known matters of direct observation or existing reality; which are open to discovery or verification (the answer option indicates such a statement with an 'F')
- Inferences, which are logical conclusions or deductions drawn about the unknown, on the basis of the known i.e. based on the knowledge of facts (the answer option indicates such a statement with an 'I')
- Judgments, which are opinions or predictions or recommendations or estimates or anticipations of common sense or intention that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future (the answer option indicates such a statement with a 'J')

Select the answer option that best describes the set of statements.

1. There is no question that Asia's recent financial crises ravaged the credibility of a supposedly distinctive East Asian, or Japanese, model of economic growth based on cooperation between conglomerates and astute government officials.
2. Donald Emmerson's comparison of the economic resilience of nine East Asian countries and the degree of political freedom enjoyed by their populations suggests that, although there is not a direct relationship in every case, other things being equal, the economies best able to withstand the present crisis may prove to have been those with more political freedom.
3. Transparency of decision-making processes would go hand-in-hand with enhanced political freedom.
4. The fact that Northeast Asian economies tended to fare better than those of Southeast Asia, is a reflection of their distance from Thailand, where the crisis started.
5. Finally, a culturalist might note that: the five most economically resilient places on the list – Japan, Taiwan, Hong Kong, Singapore, and South Korea – were also those most indebted to China historically or demographically, that is, by tradition or migration.

a) **JIJIJ**

b) **FJJIF**

c) **FIJIJ**

d) **JIJFJ**

Sentence 1: Sentence 1 can be summarised as: Asia's recent financial crisis ravaged the credibility of another model (followed by explanation of what is the model). It cannot be factually verified, since 'ravaged the credibility' is not a verifiable factor. Hence, this sentence is a Judgment – J.

Sentence 2: Consider the sentence, which has multiple parts. *Donald Emmerson's comparison of (the economic resilience of nine East Asian countries - X) and (the degree of political freedom enjoyed by their populations - Y) suggests that, although (there is not a direct relationship in every case - A), other things being equal, (the economies best able to withstand the present crisis may prove to have been those with more political freedom - B).* The comparison of X and Y suggests that although A is the case, B happens. In short, there is a logical explanation and working out of a conclusion. An argument has been presented. This is an inference – I.

Sentence 3: This is an opinion which can neither be verified nor understood from another source statement. Hence, it is a Judgment – J.

Sentence 4: A conclusion has been presented (Northeast Asian economies tended to fare better than those of Southeast Asia) and the reason has been given (is a reflection of their distance from Thailand, where the crisis started). Hence, this is an Inference – I

Sentence 5: This is extremely similar to the previous sentence, except in one regard: the usage of 'is a reflection of' in the previous sentence. That makes the previous sentence, a cause and effect sequence. In this sentence, it is simply an opinion without a cause and effect relationship. Hence, this sentence is a Judgment – J.

So, JIJIJ. Choice (A)

Q24. DIRECTIONS for questions 21 to 24: Each of the following questions has a set of five sequentially ordered statements. Classify the statements into Facts, Inferences and Judgements based on the following criteria:

- Facts, which deal with pieces of information that one has seen, heard or read; which are known matters of direct observation or existing reality; which are open to discovery or verification (the answer option indicates such a statement with an 'F')
- Inferences, which are logical conclusions or deductions drawn about the unknown, on the basis of the known i.e. based on the knowledge of facts (the answer option indicates such a statement with an 'I')
- Judgments, which are opinions or predictions or recommendations or estimates or anticipations of common sense or intention that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future (the answer option indicates such a statement with a 'J')

Select the answer option that best describes the set of statements.

1. Set income-tax tax rates to zero and governments will not earn any revenue.
2. Set them to 100%, and they will also collect nothing because people will have little incentive to work.
3. Somewhere in between zero and 100% tax rates lies a sweet spot where government revenues are maximised.
4. So, when tax rates are very high, it is possible both to lower tax rates and to raise revenues.
5. It follows that tax cuts might pay for themselves, and more.

a) IJIIJ

b) FIFII

c) FIFJI

d) FJFII

Sentence 1: Sentence 1 can be verified. Zero revenue is verifiable and so are tax rates. So, it is a Fact – F.

Sentence 2: Sentence 2 offers a conclusion (they will collect nothing) and the reason behind it. (no incentive). Hence, it is an Inference – I.

Sentence 3: Sentence 3 can be verified – because it connects two objective parameters – tax rates and government revenue. Hence, it is a Fact – F.

Sentence 4: Sentence 4 is an inference that follows from the previous statements. "So ... it is possible...." is a conclusive statement. This is an Inference – I.

Sentence 5: Sentence 5 offers a conclusion using the expression 'It follows that' – an indicator of an argument made on the basis of something established already. This statement is an Inference – I.

Hence, FIFII.

Choice (B)

Q25. DIRECTIONS for question 25 to 27: Each of the following questions has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

Silicon Valley, the heartland of America's technology industry, takes its name from the chemical element that is the most important ingredient in microchips. Most of the attention it now attracts is directed at companies such as Facebook, Google and Apple, which are better known for their software and nifty devices rather than the chips that make them work. But it was in the Valley in the 1950s and 1960s where inventions like the transistor and the integrated circuit were refined, helping

to transform computers from unreliable machines the size of a room into dependable devices that fit neatly into pockets. _____

- a) Modern microchips are now embedded into everything from cars and washing machines to fighter planes.
- b) That in turn enabled the technology titans of today to prosper.
- c) These hugely complicated products have spawned an equally complex supply chain involving thousands of specialized companies all around the world.
- d) Chips will be the internal-combustion engines that turn data into something useful.

The para introduces Silicon Valley as the heartland (*the central or most important part of a field of activity*) of America's technology industry. It then mentions the names of some technology companies. The penultimate sentence of the para talks about computers getting transformed into dependable devices because of improvements made to the transistor and the integrated circuit.

Option A: Option A sounds like an introduction sentence of another paragraph. Option A extolls the pervasiveness of modern microchips and this idea runs tangent to the given paragraph. It doesn't continue the idea of the penultimate sentence of the para, of how certain inventions helped to transform computers from unreliable bulky machines into dependable devices.

Option B: The para tells us that technology companies in Silicon valley known for their software and nifty devices get a lot of attention. But certain inventions were refined and these helped to transform computers from bulky unreliable machines into small dependable devices. So though technology companies in the Silicon valley are gaining a lot of attention for their software and nifty devices, it was certain breakthroughs in technology that converted computers from unreliable machines into dependable devices. Hence option B is the consequence of the point made in the penultimate para and it effectively brings the para to a close.

Option C: "hugely complicated products" in option C has a negative connotation and cannot be attributed to "dependable devices" in the penultimate sentence of the para. "equally complex supply chain" in option C again is negative in tone. This point would need further substantiation in terms of a discussion about the components of the supply chain and a mention of suppliers, raw materials, and components of a chip and how all these move across the world. So option C is not apt.

Option D: Option D offers an analogy that is too general. This is out of context and can belong to a para solely dedicated to a discussion of microchips and the importance of chipmaking. Also, option D unnecessarily changes the tense (future tense 'will be'). Like option A, option D can belong to another para. In fact, both option A and D can belong to the same para.

Choice B is the best choice that offers closure and completion.

Choice (B)

Q26. DIRECTIONS for question 25 to 27: Each of the following questions has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

The scientific way of thinking is at once imaginative and disciplined. This is central to its success. Science invites us to let the facts in, even when they don't conform to our preconceptions. It counsels us to carry alternative hypotheses in our heads and see which best fit the facts. It urges on us a delicate balance between no-holds-barred openness to new ideas, however heretical, and the most rigorous sceptical scrutiny of everything — new ideas and established wisdom.

-
- a) This kind of thinking is an essential tool for society to adapt to an age of change.

- b) In fact, shaking up the very foundations of what a believable fact is and what isn't, can improve scientific thinking.
- c) But most new ideas do not stand the strain of sceptical scrutiny, thus making a strong case for established wisdom.
- d) In the long run, it is openness to new and nonconformist ideas that allows us to recalibrate the established wisdom.

The para starts by extolling the virtues of scientific way of thinking and develops it to conclude that a balance is needed between new ideas and established wisdom. The para is essentially complete, so it is important to avoid new ideas in the last sentence and instead pick something that offers closure and conclusion.

Option A: This is a good last sentence as it answers the one big question one would arrive at in the para – why should we encourage the scientific way of thinking? Because we need to adapt to an age of change.

Option B: While it starts with a positive connector 'in fact', it proceeds on a tangent by talking about how to improve scientific thinking, which doesn't sync with the rest of the para (because the para is all gung-ho about the scientific way of thinking). Hence, Option B can be rejected.

Option C: This shifts the gears to a different idea altogether. The whole para is built to talk about a balance between new ideas and existing wisdom, but this option moves towards established wisdom, and points out that new ideas are not successful. This contradicts the para which asks for a no-holds-barred openness to new ideas. We wouldn't be asked to be open to new ideas if the last line eventually points out that new ideas don't stand scrutiny. Hence, Option C is not the answer.

Option D: This option swings the other way by taking the third line '*Science invites us to let the facts in, even when they don't conform to our preconceptions*' to an extreme, digressing therefore, from what follows next in the para – urging us to look for a balance. So, a conclusion that recalibrates what is wisdom (contradicting the meaning of wisdom in the para – which is conventional and what is held to be true currently) goes against the flow of the para. Option D is not the answer.

Choice (A)

Q27. DIRECTIONS for question 25 to 27: Each of the following questions has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

Why is it that of every hundred gifted young musicians who study at prestigious universities or every hundred brilliant young scientists who go to work in major labs under illustrious mentors, only a

handful will write memorable musical compositions or make scientific discoveries of major importance? Are the majority, despite their gifts, lacking in some further creative spark? Are they missing characteristics other than creativity that may be essential for creative achievement — such as boldness, confidence, independence of mind? It takes a special energy, over and above one's creative potential, a special audacity or subversiveness, to strike out in a new direction once one is settled.

- a) Many creators never really make that leap from mastery to such major creativity.
- b) It is a gamble as all creative projects must be, for the new direction may not turn out to be productive at all.
- c) This is because creativity involves not only years of conscious preparation and training but also years of unconscious preparation.
- d) Often, creators satisfy themselves with reaching a level of mastery, and then remain at that plateau for the rest of their careers.

The para raises a question – as to why few experts go on to create something of their own whether it is in science or music. The penultimate line (the line before the blank) gives the reason – it takes a special energy over and above the potential. This tone has to be continued in the conclusion to the para.

Option A: There are two issues with this option. When it says 'such creativity', it is expected that the previous sentence has an example of some form of creativity for the pronoun 'such' to point to something. But, the penultimate line doesn't have any such entities that could be referred to. Secondly, the theme of the para is the jump from 'creative potential' to 'creating something', not 'mastery' to 'creativity'. Hence, Option A is not the answer.

Option B: If you call it a gamble, then either outcome is possible – good or bad. The para cannot end on such a note of indecisiveness, as it clearly conveys that not everyone really translates the creative potential into actual work. So, calling it a gamble to take on a new direction opens up the debate again and hence is not a good end to the para. Option B is not the answer. Further, the second half of option B paints the 'new-direction' in a negative light (may not turn out to be productive). This would incorrectly contrast the positive tone evident in the penultimate sentence (strike out in a new-direction).

Option C: The lines above talk about a creative spark, the extra, a special audacity and energy. So, that cannot be followed with a line that talks about a subconscious preparation which is an entirely different tangent. On top of that, the option starts with 'this is because', a rigid connector that definitely needs a connection (absent here) with the previous sentence. Hence, Option C is not the answer.

Option D: This covers all the ideas and checks the boxes. It explains why most gifted and brilliant musicians and scientists don't go on to create something. They are 'satisfied' with achieving the expertise, and never really push themselves to convert the creative potential to anything higher – they sit on the plateau for years to come. This option, if noticed, is quite close to Option A, except in the usage of 'such creativity' and in how 'mastery' is interpreted. They don't create, not because they don't make a jump from mastery to creativity as in Option A, but because they are satisfied in their own mastery and never really push forward to create. Option D is the answer.

Choice (D)

Q28. DIRECTIONS for questions 28 to 31: Read each of the following arguments and answer the question given below it.

Brian Davies (in the "Notices of the American Mathematical Society"): The four-colour-map theorem in topology was proved in 1976 with the help of supercomputers, which exhaustively checked a huge but finite number of possibilities. No human mathematician could ever verify all the intermediate steps in this brutal proof. Even if someone claimed to, should we trust them? To this day, no one has come up with a more elegant, insightful proof. So we're left in the unsettling position of knowing that the four color-theorem is true but still not knowing why. In my own field of complex systems theory, Stephen Wolfram has emphasised that there are simple computer programs, known as cellular automata, whose dynamics can be so inscrutable that there's no way to predict how they'll behave;

the best you can do is simulate them on the computer, sit back, and watch how they unfold. Observation replaces insight. Mathematics becomes a spectator sport.

Which of the following can be inferred from the above argument?

- a) The mathematical result in question is unacceptable because it was derived with the help of a supercomputer.
- b) In various fields of mathematics, there are cases where we are able to figure out what's true or false but are unable to understand why.
- c) If loss of insight is happening in mathematics, the supposed pinnacle of human reasoning, it seems likely to afflict man in science and other disciplines as well.
- d) For the mathematical proof in question to be verified, there must be someone who can fully comprehend the process by which it was derived.

Option A: The para does not talk about acceptance or rejection of a mathematical result. It refers to the lack of human insight in understanding or verifying the steps of a proof or a mathematical process. Option A is not the answer.

Option B: Observation replaces insight. Mathematics becomes a spectator sport. Hence we can infer that option B is the correct answer. Insight is becoming impossible, at least in various fields of mathematics.

Option C: Option C is far-fetched. The para revolves around the field of mathematics only, not other fields.

Option D: Theorems were proved with the help of supercomputers, which exhaustively checked a huge but finite number of possibilities. No human mathematician could ever verify all the intermediate steps in this brutal proof. Even if someone claimed to, should we trust them? To this day, no one has come up with a more elegant, insightful proof. Option D can be the assumption of Brian Davies. He says that no one could comprehend the theorems even though computers proved them after checking a huge but finite number of possibilities. Option D is not the inference.

Choice (B)

Q29. DIRECTIONS for questions 28 to 31: Read each of the following arguments and answer the question given below it.

Dale Carnegie told a story about the steel magnate Charles M. Schwab. One evening, to incentivise the workers in a mill, Schwab wrote on the floor the amount of steel the day shift had produced. Seeing the number, the night shift worked hard to top it, marking its own figure down. Soon the two

shifts were vying for bragging rights, and production soared. "The way to get things done," Schwab said, "is to stimulate competition." Servers at the Massachusetts-based restaurant chain Not Your Average Joe's always know how they're doing relative to their colleagues, owing to a cutting-edge workforce management system. Rather than forecasting demand and staffing a restaurant accordingly, as most systems do, the software tracks waitstaff performance in terms of per-customer sales and satisfaction (gauged by tips). Highly rated servers are given more tables and preferred schedules. By shifting work to its best servers, the restaurant hopes to increase profits and motivate all employees.

Which of the following scenarios make a case for stimulating competition?

- I. In a company where the top half was originally twice as productive as the bottom half, stimulating competition nearly doubled the productivity of the bottom half, while increased workload nearly halved the productivity of the top half.
- II. In a company where all employees were originally equally productive, stimulating competition resulted in one-half performing 50% better and the others slacking by the same degree.
- III. In a company where a quarter of the employees were twice as productive as the rest, stimulating competition doubled the productivity of the former, while forcing half of the latter to quit, due to anxiety issues.
- IV. In a company where one-fifths of the employees were twice as productive as the rest, stimulating competition first doubled the productivity of the former as well as that of the latter, after which the productivity plateaued.

a) Only I and IV

b) Only IV

c) Only III

d) Only II and III

In I, the overall output is narrowly lower than the original output. Hence, it doesn't make a case for stimulating competition.

In II, the overall output remained the same despite stimulating competition. This doesn't make a case for the argument above either.

In III, the overall output increases with reduced employee count. However, since it causes anxiety among the low-performers and doesn't motivate all employees (as indicated in the given paragraph), it doesn't make a strong case for stimulating competition.

In IV, the overall output increases massively for a year, and then plateaus. Since the productivity plateaus at a higher level than the original, this option makes a case for stimulating competition. Only IV is correct.

Hence, the answer is option B.

Choice (B)

Q30. DIRECTIONS for questions 28 to 31: Read each of the following arguments and answer the question given below it.

One view of the impact of labour on valuation suggests that asking customers to assume production costs should result in reduced willingness to pay, once customers subtract the value of their labour from the overall cost of the product; examples, instead, suggest that when people imbue products with their own labour, their effort can increase their valuation. And while some labour is enjoyable (building a bear with one's nephew) and some labour allows for product customization (building a bear with one's alma mater's logo) – both of which might increase valuation – we suggest that labour alone can be sufficient to induce greater liking for the fruits of one's labour: even constructing a standardized bureau, an arduous, solitary task, can lead people to overvalue their (often poorly constructed) creations. We call this phenomenon the "IKEA effect," in honour of the Swedish manufacturer whose products typically arrive with some assembly required.

Consider that an IKEA product involves a customer's labour whereas a non-IKEA product doesn't, all other parameters being similar. Which of the following, when proven, most ascertains the veracity of the author's claim?

- a) **Customers are more willing to pay for an IKEA product than to pay for a non-IKEA product.**
- b) **Customers are willing to pay more for an IKEA product than for a non-IKEA product.**
- c) **Customers are as willing to pay for an IKEA product as they are to pay for a non-IKEA product.**

- d) Customers are willing to pay more for an IKEA product than for a non-IKEA product, provided they enjoyed building the customised IKEA product.

Option A: Consider the underlined parts: '*One view of the impact of labour on valuation suggests that asking customers to assume production costs should result in reduced willingness to pay, once customers subtract the value of their labour from the overall cost of the product; examples, instead, suggest that when people imbue products with their own labour, their effort can increase their valuation.*' Hence, willingness to pay has been associated with valuation in the para. So, a customer's greater liking for a product can be proven by greater willingness to pay for the product. Hence, Option A is the best way to ascertain the veracity of the author's claim.

Option B: This is a close option and quite similar to Option A, in that it depicts an increase in valuation of the product. However, the only difference is that this option assumes that the customer is considering buying both products (the one that involves labour and the one that doesn't). Only in that case, is it actually possible to compare what the customer is willing to pay for either product. However, we cannot make such an assumption as the para indicates the customer is looking at one product and tries to draw conclusions about the product the customer will pick. In other words, the valuation is in terms of willingness to buy rather than the monetary value. Hence, Option B, is second best to Option A.

Option C: This option suggests that the customer wants to pay the same amount of money for an IKEA product, where labour is involved. There is no reduction in valuation despite the labour involved. However, this is only half the logic explained in the para. In fact, customers are more willing once their labour is involved (as understood from '*when people imbue products with their own labour, their effort can increase their valuation*'). Hence, Option C is not the answer.

Option D: The para clearly states that enjoyment is not an important parameter in the valuation of the product – labour alone is sufficient to increase valuation. This can be understood from: 'And while some labour is enjoyable (*building a bear with one's nephew*) and some labour allows for product customization (*building a bear with one's alma mater's logo*) – both of which might increase valuation – we suggest that labour alone can be sufficient to induce greater liking for the fruits of one's labour.'

Hence, Option D is not the answer.

Choice (A)

Q31. DIRECTIONS for questions 28 to 31: Read each of the following arguments and answer the question given below it.

If you read what Peter Drucker had to say about competition back in the late '50s and early '60s, he really only talked about one thing: competition on price. It was this received opinion that Michael Porter was questioning. And so he famously argued, that in addition to the fierceness of price competition among industry rivals, the degree of competitiveness in an industry, that is, the degree to which players are free to set their own prices, depends on the bargaining power of buyers and of

suppliers, as well as how threatening substitute products and new entrants are. When these forces are weak, as in software and soft drinks, many companies are profitable. When they are strong, as in the airline and hotel industries, almost no company earns an attractive return on investment. Strategy is a matter of working out your company's best position relative not just to pricing pressures from rivals but to all the forces in your competitive environment. And for many, it seemed, that was pretty much the last word on the subject.

Which of the following best explains the function of the two boldfaced statements in the para above?

- a) **The first statement provides irrefutable evidence to prove the conclusion in the second statement right.**
- b) **The first statement points to a mistake in the conclusion which has been refuted by the second statement.**
- c) **The first statement is based on an assumption, which if true, will strengthen the second statement.**
- d) **The first statement, if true, helps modify a previous conclusion, in order to arrive at the conclusion in the second statement.**

Option A: The first statement is an opinion and not 'evidence' (which can be verified). It supports the second statement but doesn't necessarily prove the conclusion. Option A is not the answer.

Option B: The first statement doesn't point to a mistake. It extends a previous understanding (that fierceness of price competition decides pricing strategy). So, it cannot be said that the second conclusion (it is not just the pricing competition but bargaining power of suppliers and buyers that determines pricing) refutes the first conclusion. Hence, Option B is not the answer.

Option C: There is no hidden assumption in the first statement. Hence, Option C is not the answer.

Option D: The new information that, the bargaining power of buyers and suppliers also affects pricing, if true, will help arrive at the modified conclusion provided in the second statement, that it is not just pricing competition but other factors which determine the strategy of companies. Hence, Option D is the answer.

Choice (D)

Q32. DIRECTIONS for questions 32 to 34: In each of the following questions, the word in bold and capitals is used in six different ways. Identify the option(s) in which the usage of the word is INCORRECT or INAPPROPRIATE and enter the number corresponding to the sentence(s) (in which

the usage is INCORRECT or INAPPROPRIATE) in the input box provided below each question.
[Note: Enter your answer in increasing order only. For example, if you think that sentences (1) and (3) are incorrect, then enter 13 (but not 31) in the input box].

CHECK

1. A customs official met them at the plane and checked their documents over before giving them the necessary clearance to enter the United Kingdom.
2. Kate Middleton looked chic dressed in a pale blue check as she attended the MET Gala along with her friend.
3. The condition of the plumbing and the wiring of a vintage home can serve as a check for the level of the seller's home maintenance.
4. The CEO decided to check the stakes once he was sure that his team members could deliver on the new project.
5. There is no check up on the terrorist activities in the area.
6. The municipal authorities checked into the flow of water from the dam.

The usage of the word 'check' is incorrect in sentences 4, 5 and 6.

Sentence (4) would need the usage: "raise the stakes". This means To increase one's commitment or involvement. "check the stakes" is incorrect.

"check up on" is incorrect in sentence 5. The sentence should read: There is no check on the terrorist activities in the area. This means that there is no control, restraint, restriction, obstruction etc.

Similarly, in sentence 6, "checked into" is incorrect usage. "checked into" means "to make an enquiry or investigation for a verification". The context here requires the usage of "control" or restraint". Hence it would suffice to say "The municipal authorities checked the flow of water from the dam."

The usage of the word is correct in the remaining sentences.

In (1), "checked over" means "to look over, to examine".

In (2), "pale blue check" means "a pale blue dress or fabric patterned with squares".

In (3), the context refers to "a standard for inspecting or evaluating; a test".

Hence, the required answers are (4), (5) and (6).

Ans: (456)

Q33. DIRECTIONS for questions 32 to 34: In each of the following questions, the word in bold and capitals is used in six different ways. Identify the option(s) in which the usage of the word is INCORRECT or INAPPROPRIATE and enter the number corresponding to the sentence(s) (in which the usage is INCORRECT or INAPPROPRIATE) in the input box provided below each question.

[Note: Enter your answer in increasing order only. For example, if you think that sentences (1) and (3) are incorrect, then enter 13 (but not 31) in the input box].

RULE

1. The option of realigning the metro railway route and starting from scratch has been ruled out.
2. The judge gave his rules in favour of the diplomat.
3. It was his rule to visit the church before going to work everyday.

4. In my company, excellence is the rule rather than the exception.
5. He could afford to bend the rules with impunity because of his 'connections.'
6. As a thumb rule, two teaspoons of sugar are adequate for a large mug of coffee.

The usage of the word 'rule' is incorrect in sentence (2). The usage should be:
The judge gave his ruling OR The judge ruled in favour of

The usage of the word is correct in the remaining sentences.

In (1), "ruled out" means excluded, not considered.

In (3), "was his rule" means "in general, for the most part".

In (4), "is the rule" refers to "customary or normal circumstance".

In (5), "bend the rules with impunity" means to do or allow something which should not be done/ allowed.

In (6), "thumb rule" means "principle with broad application that is not intended to be strictly accurate but correct enough".

Hence, the required answer is (2).

Ans: (2)

Q34. DIRECTIONS for questions 32 to 34: In each of the following questions, the word in bold and capitals is used in six different ways. Identify the option(s) in which the usage of the word is INCORRECT or INAPPROPRIATE and enter the number corresponding to the sentence(s) (in which the usage is INCORRECT or INAPPROPRIATE) in the input box provided below each question.
[Note: Enter your answer in increasing order only. For example, if you think that sentences (1) and (3) are incorrect, then enter 13 (but not 31) in the input box].

CUL-DE-SAC

1. These Europeans were not parochial cul-de-sacs, but instead lived across immensely varied lands well into Asia.
2. If your job is a cul-de-sac, you have to shift to make sure your career is not over.
3. The use of cul-de-sacs in the design of suburban neighbourhoods became popular after World War II as a way to curb traffic in areas where children play.
4. I can't buy my way out of this cul-de-sac of life.
5. He was tempted into the cul-de-sac of popular British cinema at a time when that appeared to offer regular work and the easy hit of popular fame.
6. Residents in a village cul-de-sac were awoken by the "sound of mooing" when about 40 cows invaded their street.

Cul-de-sac means 'a street or passage closed at one end' or 'a blind alley' - a street that is designed to connect to another street only at one end.

In sentence 1, the word 'parochial' means narrow/insular/illiberal. So, the sentence intends to say that the Europeans didn't live and settle only in one area, insulated or cut-off. They kept moving further 'well into Asia'. However, the term 'cul-de-sac' cannot be directly used for people (since cul-de-sac is just an expression for one-side-exit and humans cannot be equated to that). Hence, 1 is not the right usage and is the answer.

In sentence 2, the usage is metaphorical. 'If your job is a cul-de-sac' means if your job is a dead-end and there is no progression. This is also hinted at in the second part of the sentence (...to make sure your career is not over). This is a correct usage of the capitalised word.

In sentence 3, we encounter the literal meaning of cul-de-sacs, blind alleys or neighbourhoods, where one end is blocked off and entry and exit can only happen from one side. This is appropriate usage.

In sentence 4, *Cul-de-sac of life* represents a blind alley or dead end from where one cannot exit from the other side. Hence, 'I cannot buy my way out'. This is a metaphorical usage, and hence, appropriate.

In sentence 5, '*cul-de-sac of popular British cinema at a time when that appeared to offer regular work and the easy hit of popular fame*' indicates that British cinema offered regular work (and yet, not an evolution/progress). So, 5 also provides a correct usage of 'cul-de-sac'.

In sentence 6, this is the physical cul-de-sac, a corner of the village from where one can exit only in one direction. So, logic apart, this usage is appropriate. Hence, the required answer is (1).

Ans: (1)

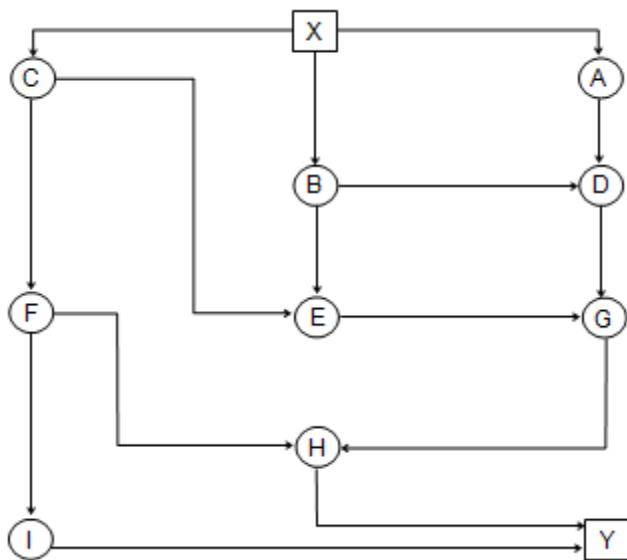
DILR

DIRECTIONS for questions 1 to 4: Answer the questions on the basis of the information given below.

A particular task involves different events – X being the first event, A through I being the intermediate events and Y being the last event. Once the event Y is completed, the task is said to be completed. The table below shows the time required and the cost incurred to complete each of the events.

Event	X	A	B	C	D	E	F	G	H	I	Y
Cost (in ₹'000)	15	11.5	5	14.25	4.5	3.25	7.5	2.5	7.5	11	7
Time (in days)	13	7	15	13	18	12	15	20	15	20	7

The flow chart below gives the only possible courses of events (i.e., order of completion of events) after which one can start event Y, beginning from event X. Further, except the first and the last events, none of the intermediate events is essential, i.e., for example, event Y can be started if either event H or event I is completed, and similarly event G can be started if either event D or event E is completed.



Q1. DIRECTIONS for question 1: Select the correct alternative from the given choices.
The number of days required to complete the task by incurring the least total cost is

- a) 75
- b) 80
- c) 82
- d) 87

The possible ways to complete the task, the cost and the time required is tabulated below.

	Route	Total cost	Total time
I	XADGHY	$15 + 11.5 + 4.5 + 2.5 + 7.5 + 7 = 48$	$13 + 7 + 18 + 20 + 15 + 7 = 80$
II	XBDGHY	$15 + 5 + 4.5 + 2.5 + 7.5 + 7 = 41.5$	$13 + 15 + 18 + 20 + 15 + 7 = 88$
III	XBEGHY	$15 + 5 + 3.25 + 2.5 + 7.5 + 7 = 40.25$	$13 + 15 + 12 + 20 + 15 + 7 = 82$
IV	XCEGHY	$15 + 14.25 + 3.25 + 2.5 + 7.5 + 7 = 49.5$	$13 + 13 + 12 + 20 + 15 + 7 = 80$
V	XCFHY	$15 + 14.25 + 7.5 + 7.5 + 7 = 51.25$	$13 + 13 + 15 + 15 + 7 = 63$
VI	XCFIY	$15 + 14.25 + 7.5 + 11 + 7 = 54.75$	$13 + 13 + 15 + 20 + 7 = 68$

Least cost is ₹40,250 and the number of days = 82.

Choice (C)

Q2. DIRECTIONS for question 2: Type in your answer in the input box provided below the question. If the task has to be completed in less than 80 days, then what will be the minimum possible total cost (in Rs.) incurred?

The possible ways to complete the task, the cost and the time required is tabulated below.

	Route	Total cost	Total time
I	XADGHY	$15 + 11.5 + 4.5 + 2.5 + 7.5 + 7 = 48$	$13 + 7 + 18 + 20 + 15 + 7 = 80$
II	XBDGHY	$15 + 5 + 4.5 + 2.5 + 7.5 + 7 = 41.5$	$13 + 15 + 18 + 20 + 15 + 7 = 88$
III	XBEGHY	$15 + 5 + 3.25 + 2.5 + 7.5 + 7 = 40.25$	$13 + 15 + 12 + 20 + 15 + 7 = 82$
IV	XCEGHY	$15 + 14.25 + 3.25 + 2.5 + 7.5 + 7 = 49.5$	$13 + 13 + 12 + 20 + 15 + 7 = 80$
V	XCFHY	$15 + 14.25 + 7.5 + 7.5 + 7 = 51.25$	$13 + 13 + 15 + 15 + 7 = 63$
VI	XCFIY	$15 + 14.25 + 7.5 + 11 + 7 = 54.75$	$13 + 13 + 15 + 20 + 7 = 68$

V and VI are the possible cases and ₹51,250 is the least cost.

Ans: (51250)

Q3. DIRECTIONS for questions 3 and 4: Select the correct alternative from the given choices. If the total cost incurred cannot exceed Rs.50,000 and the task has to be completed in less than 77 days, then in how many ways can it be completed?

a) 0

b) 1

c) 2

d) 3

The possible ways to complete the task, the cost and the time required is tabulated below.

	Route	Total cost	Total time
I	XADGHY	$15 + 11.5 + 4.5 + 2.5 + 7.5 + 7 = 48$	$13 + 7 + 18 + 20 + 15 + 7 = 80$
II	XBDGHY	$15 + 5 + 4.5 + 2.5 + 7.5 + 7 = 41.5$	$13 + 15 + 18 + 20 + 15 + 7 = 88$
III	XBEGHY	$15 + 5 + 3.25 + 2.5 + 7.5 + 7 = 40.25$	$13 + 15 + 12 + 20 + 15 + 7 = 82$
IV	XCEGHY	$15 + 14.25 + 3.25 + 2.5 + 7.5 + 7 = 49.5$	$13 + 13 + 12 + 20 + 15 + 7 = 80$
V	XCFHY	$15 + 14.25 + 7.5 + 7.5 + 7 = 51.25$	$13 + 13 + 15 + 15 + 7 = 63$
VI	XCFIY	$15 + 14.25 + 7.5 + 11 + 7 = 54.75$	$13 + 13 + 15 + 20 + 7 = 68$

There is no such possible case.

Choice (A)

Q4. DIRECTIONS for questions 3 and 4: Select the correct alternative from the given choices.

At the beginning of the task, i.e., while starting event X, the persons entrusted with the task came to know that the machinery required for beginning event C needs repair and would take 25 days to come to a workable condition. If the repair work can start simultaneously with event X, what is the minimum number of days required for the task to be completed?

a) 80

b) 75

c) 70

d) 78

The possible ways to complete the task, the cost and the time required is tabulated below.

	Route	Total cost	Total time
I	XADGHY	$15 + 11.5 + 4.5 + 2.5 + 7.5 + 7 = 48$	$13 + 7 + 18 + 20 + 15 + 7 = 80$
II	XBDGHY	$15 + 5 + 4.5 + 2.5 + 7.5 + 7 = 41.5$	$13 + 15 + 18 + 20 + 15 + 7 = 88$
III	XBEGHY	$15 + 5 + 3.25 + 2.5 + 7.5 + 7 = 40.25$	$13 + 15 + 12 + 20 + 15 + 7 = 82$
IV	XCEGHY	$15 + 14.25 + 3.25 + 2.5 + 7.5 + 7 = 49.5$	$13 + 13 + 12 + 20 + 15 + 7 = 80$
V	XCFHY	$15 + 14.25 + 7.5 + 7.5 + 7 = 51.25$	$13 + 13 + 15 + 15 + 7 = 63$
VI	XCFIY	$15 + 14.25 + 7.5 + 11 + 7 = 54.75$	$13 + 13 + 15 + 20 + 7 = 68$

Event C can be taken place only after completion of event X, i.e., after 13 days of the starting of the task.

∴ In the possible ways where C is involved, the project will be delayed by $25 - 13 = 12$ days.

∴ The least possible number of days = $63 + 12 = 75$

Choice (B)

DIRECTIONS for questions 5 to 8: Answer these questions on the basis of the information given below.

Ravi had a calculator which had ten digits and all the basic mathematical operators. He decided to clean the calculator by removing all the keys and while reassembling it, he interchanged the locations of three pairs of keys. For example, if he placed the key '9' in the place of the key '6', he placed the key '6' only in the place of the key '9' and not any other key. All the six keys that were interchanged corresponded only to numbers and not to any mathematical operators. Later, he input some calculations and obtained outputs as provided in the table below. The input is shown in terms of the keys that Ravi pressed, while the output is the output displayed by the calculator.

Input	Output
$128 + 64$	195
$912 + 43$	942
$95 + 84$	128
$178 + 19$	192

Q5. DIRECTIONS for question 5: Select the correct alternative from the given choices.

The key of which of the following numbers was not interchanged with any other number in the calculator?

a) 2

b) 3

c) 5

d) 7

From the first calculation we can see that 1 must be interchanged with either 0 or must not have been interchanged. If 1 was interchanged with a higher number i.e., 2 or 3, the output would have been greater than 200.

From the fourth calculation we can see that if 1 was interchanged with 0, the input would have been a sum of one two-digit number and one one-digit number, which can never be greater than $99 + 9$. Hence, **1 must not have been interchanged**.

From the second calculation, 9 could have been interchanged with 8 or it might not have been interchanged. If 9 was interchanged with 8, the third calculation would be $8x + 9x$ (since 8 and 9 are interchanged) which must be around 180. But since the sum of these two was given as 128, 9 could not have been interchanged with 8. Hence, **9 must also not have been interchanged**.

In the fourth calculation, 1 and 9 were not interchanged. Therefore, the equation must be $1xx + 19 = 192$. $1xx$ must be 173. Therefore, **7 must not have been interchanged** and **8 must have been interchanged with 3**.

From the third calculation, $9x + 3x = 128$ (where x can be any digit). 5 and 4 in the units place must add up to 8. This means that both 5 and 4 or any one of them must have been interchanged with 2 or 6 or 0. To get a sum of 8, the only possible way is to interchange both of them with 2 and 6. Therefore, 5 and 4 must have been interchanged with 2 and 6 in any order. This implies **0 was not interchanged**.

From the second equation, considering only the units place 2+3 must be 2. 3 is replaced with 8. This implies that **2 must be replaced with 4**. Hence, **5 must be replaced with 6**.

7 was not interchanged in the calculator.

Choice (D)

Q6. DIRECTIONS for question 6: Type in your answer in the input box provided below the question.
What will be the output if Ravi inputs '314 + 470' in the calculator?

From the first calculation we can see that 1 must be interchanged with either 0 or must not have been interchanged. If 1 was interchanged with a higher number i.e., 2 or 3, the output would have been greater than 200.

From the fourth calculation we can see that if 1 was interchanged with 0, the input would have been a sum of one two-digit number and one one-digit number, which can never be greater than $99 + 9$. Hence, **1 must not have been interchanged**.

From the second calculation, 9 could have been interchanged with 8 or it might not have been interchanged. If 9 was interchanged with 8, the third calculation would be $8x + 9x$ (since 8 and 9 are interchanged) which must be around 180. But since the sum of these two was given as 128, 9 could not have been interchanged with 8. Hence, **9 must also not have been interchanged**.

In the fourth calculation, 1 and 9 were not interchanged. Therefore, the equation must be $1xx + 19 = 192$. $1xx$ must be 173. Therefore, **7 must not have been interchanged** and **8 must have been interchanged with 3**.

From the third calculation, $9x + 3x = 128$ (where x can be any digit). 5 and 4 in the units place must add up to 8. This means that both 5 and 4 or any one of them must have been interchanged with 2 or 6 or 0. To get a sum of 8, the only possible way is to interchange both of them with 2 and 6. Therefore, 5 and 4 must have been interchanged with 2 and 6 in any order. This implies **0 was not interchanged**.

From the second equation, considering only the units place 2+3 must be 2. 3 is replaced with 8. This implies that **2 must be replaced with 4**. Hence, **5 must be replaced with 6**.

314 corresponds to an actual input of 812. 470 corresponds to an actual input of 270.
Sum of the two = 1082. Ans: (1082)

Q7. DIRECTIONS for questions 7 and 8: Select the correct alternative from the given choices.
For which of the following numbers will the output of the calculator be the same as the input?

- a) 958
- b) 674
- c) 423
- d) 107

From the first calculation we can see that 1 must be interchanged with either 0 or must not have been interchanged. If 1 was interchanged with a higher number i.e., 2 or 3, the output would have been greater than 200.

From the fourth calculation we can see that if 1 was interchanged with 0, the input would have been a sum of one two-digit number and one one-digit number, which can never be greater than $99 + 9$. Hence, **1 must not have been interchanged**.

From the second calculation, 9 could have been interchanged with 8 or it might not have been interchanged. If 9 was interchanged with 8, the third calculation would be $8x + 9x$ (since 8 and 9 are interchanged) which must be around 180. But since the sum of these two was given as 128, 9 could not have been interchanged with 8. Hence, **9 must also not have been interchanged**.

In the fourth calculation, 1 and 9 were not interchanged. Therefore, the equation must be $1xx + 19 = 192$. $1xx$ must be 173. Therefore, **7 must not have been interchanged** and **8 must have been interchanged with 3**.

From the third calculation, $9x + 3x = 128$ (where x can be any digit). 5 and 4 in the units place must add up to 8. This means that both 5 and 4 or any one of them must have been interchanged with 2 or 6 or 0. To get a sum of 8, the only possible way is to interchange both of them with 2 and 6. Therefore, 5 and 4 must have been interchanged with 2 and 6 in any order. This implies **0 was not interchanged**.

From the second equation, considering only the units place 2+3 must be 2. 3 is replaced with 8. This implies that **2 must be replaced with 4**. Hence, **5 must be replaced with 6**.

The output will be the same as the input for any number constituting the digits 0, 1, 7 and 9. From the options, the answer is 107, i.e., option D. Choice (D)

Q8. DIRECTIONS for questions 7 and 8: Select the correct alternative from the given choices.

Which of the following, if input into the calculator, will have the same output as that when 123 + 456 is input into the calculator?

- a) 189 + 981
- b) 132 + 480
- c) 439 + 142
- d) 158 + 420

From the first calculation we can see that 1 must be interchanged with either 0 or must not have been interchanged. If 1 was interchanged with a higher number i.e., 2 or 3, the output would have been greater than 200.

From the fourth calculation we can see that if 1 was interchanged with 0, the input would have been a sum of one two-digit number and one one-digit number, which can never be greater than $99 + 9$. Hence, **1 must not have been interchanged**.

From the second calculation, 9 could have been interchanged with 8 or it might not have been interchanged. If 9 was interchanged with 8, the third calculation would be $8x + 9x$ (since 8 and 9 are interchanged) which must be around 180. But since the sum of these two was given as 128, 9 could not have been interchanged with 8. Hence, **9 must also not have been interchanged**.

In the fourth calculation, 1 and 9 were not interchanged. Therefore, the equation must be $1xx + 19 = 192$. $1xx$ must be 173. Therefore, **7 must not have been interchanged** and **8 must have been interchanged with 3**.

From the third calculation, $9x + 3x = 128$ (where x can be any digit). 5 and 4 in the units place must add up to 8. This means that both 5 and 4 or any one of them must have been interchanged with 2 or 6 or 0. To get a sum of 8, the only possible way is to interchange both of them with 2 and 6. Therefore, 5 and 4 must have been interchanged with 2 and 6 in any order. This implies **0 was not interchanged**.

From the second equation, considering only the units place $2+3$ must be 2. 3 is replaced with 8. This implies that **2 must be replaced with 4**. Hence, **5 must be replaced with 6**.

123 corresponds to 148. 456 corresponds to 265. Therefore, the output of $123 + 456$ will be 413. We can calculate only the units digit first and find that only option C and option D have units digit of 3.

Option C: $439 + 142 \Rightarrow 289 + 124 = 413$

Option D: $158 + 420 \Rightarrow 163 + 240 = 403$

Hence, the answer is option C.

Choice (C)

DIRECTIONS for questions 9 to 12: Answer these questions on the basis of the information given below.

On January 1st, 2000, four friends – Rahul, Karthik, Ramesh, and Dhruv – were discussing their social security numbers and observed that their social security numbers followed a specific pattern. The ten-digit social security number of each person happened to comprise his date of birth (in YYMMDD format), weight (two-digit format, in kg) and the number of children he has (two-digit format), arranged in no particular order. The order in which the above details appeared in the social security number of any friend was not necessarily the same as that for any other friend. It is known that none of the four friends had more than 15 children and the age of any friend was less than 100.

The Social Security numbers of the four friends are given below:

Rahul – 7206310424
Karthik – 8202290214

Ramesh – 1112102565
Dhruv – 5604240178

Q9. DIRECTIONS *for questions 9 to 12*: Select the correct alternative from the given choices.
Who is the heaviest among the four?

- a) **Rahul**
- b) **Ramesh**
- c) **Karthik**
- d) **Dhruv**

Let the date of birth be denoted as DDMMYY, the number of children as NN and the weight of the individual as WW.

The Social Security (SS) number of Rahul is 7206310424. The month should be a number between 1 and 12. Therefore, the month can be either 06 or 04. But it cannot be 06 because then the date will be 31st and June does not have 31 days. Therefore the last six digits are his date of birth. The number of children cannot exceed 15. Therefore, the first two digits represent his weight. It is in the format WWNNYYMMDD. The SS number of Ramesh is 1112102565. The month of birth for Ramesh can be either the 3rd and 4th digits OR the 5th and 6th digits. It cannot be the first two digits because the date of birth is in YYMMDD format. If the first six digits represent the date of birth, the number of children he has must be either 25 or 65. Clearly, this is not possible. Therefore, the format of his social security number is NNYYMMDDWW.

For Karthik, the month of his birth can be either the 3rd and 4th digits OR the 5th and 6th digits. But it can't be 3rd and 4th digits because February in 82 does not have 29 days. Therefore, the SS number is in the format WWNNYYMMDD.

For Dhruv, the month of his birth has to be 04. Hence his SS number is of the format YYMMDDNNWW.

Name	Date of Birth	Weight	Number of Children
Rahul	24/04/1931	72	6
Ramesh	25/10/1912	65	11
Karthik	14/02/1929	82	2
Dhruv	24/04/1956	78	1

Karthik is the heaviest among the four.

Choice (C)

Q10. DIRECTIONS for questions 9 to 12: Select the correct alternative from the given choices.
Who is the oldest among the four?

- a) Rahul
- b) Ramesh
- c) Karthik
- d) Dhruv

Let the date of birth be denoted as DDMMYY, the number of children as NN and the weight of the individual as WW.

The Social Security (SS) number of Rahul is 7206310424. The month should be a number between 1 and 12. Therefore, the month can be either 06 or 04. But it cannot be 06 because then the date will be 31st and June does not have 31 days. Therefore the last six digits are his date of birth. The number of children cannot exceed 15. Therefore, the first two digits represent his weight. It is in the format WWNNYYMMDD. The SS number of Ramesh is 1112102565. The month of birth for Ramesh can be either the 3rd and 4th digits OR the 5th and 6th digits. It cannot be the first two digits because the date of birth is in YYMMDD format. If the first six digits represent the date of birth, the number of children he has must be either 25 or 65. Clearly, this is not possible. Therefore, the format of his social security number is NNYYMMDDWW.

For Karthik, the month of his birth can be either the 3rd and 4th digits OR the 5th and 6th digits. But it can't be 3rd and 4th digits because February in 82 does not have 29 days. Therefore, the SS number is in the format WWNNYYMMDD.

For Dhruv, the month of his birth has to be 04. Hence his SS number is of the format YYMMDDNNWW.

Name	Date of Birth	Weight	Number of Children
Rahul	24/04/1931	72	6
Ramesh	25/10/1912	65	11
Karthik	14/02/1929	82	2
Dhruv	24/04/1956	78	1

Ramesh is the oldest among the four.

Choice (B)

Q11. DIRECTIONS for questions 9 to 12: Select the correct alternative from the given choices.
Who among the following share the same birthday?

- a) Rahul and Ramesh
- b) Ramesh and Dhruv
- c) Rahul and Dhruv
- d) Rahul and Karthik

Let the date of birth be denoted as DDMMYY, the number of children as NN and the weight of the individual as WW.

The Social Security (SS) number of Rahul is 7206310424. The month should be a number between 1 and 12. Therefore, the month can be either 06 or 04. But it cannot be 06 because then the date will be 31st and June does not have 31 days. Therefore the last six digits are his date of birth. The number of children cannot exceed 15. Therefore, the first two digits represent his weight. It is in the format WWNNYYMMDD. The SS number of Ramesh is 1112102565. The month of birth for Ramesh can be either the 3rd and 4th digits OR the 5th and 6th digits. It cannot be the first two digits because the date of birth is in YYMMDD format. If the first six digits represent the date of birth, the number of children he has must be either 25 or 65. Clearly, this is not possible. Therefore, the format of his social security number is NNYYMMDDWW.

For Karthik, the month of his birth can be either the 3rd and 4th digits OR the 5th and 6th digits. But it can't be 3rd and 4th digits because February in 82 does not have 29 days. Therefore, the SS number is in the format WWNNYYMMDD.

For Dhruv, the month of his birth has to be 04. Hence his SS number is of the format YYMMDDNNWW.

Name	Date of Birth	Weight	Number of Children
Rahul	24/04/1931	72	6
Ramesh	25/10/1912	65	11
Karthik	14/02/1929	82	2
Dhruv	24/04/1956	78	1

Rahul and Dhruv share the same birthday.

Choice (C)

Q12. DIRECTIONS for questions 9 to 12: Select the correct alternative from the given choices.

The social security number of Rakesh, a common friend of the four, is 8412201224. If the social security number of Rakesh also followed the specified pattern, who among the five friends has the maximum number of children?

- a) Ramesh
- b) Rakesh
- c) Rahul
- d) Cannot be determined

Let the date of birth be denoted as DDMMYY, the number of children as NN and the weight of the individual as WW.

The Social Security (SS) number of Rahul is 7206310424. The month should be a number between 1 and 12. Therefore, the month can be either 06 or 04. But it cannot be 06 because then the date will be 31st and June does not have 31 days. Therefore the last six digits are his date of birth. The number of children cannot exceed 15. Therefore, the first two digits represent his weight. It is in the format WWNNYYMMDD. The SS number of Ramesh is 1112102565. The month of birth for Ramesh can be either the 3rd and 4th digits OR the 5th and 6th digits. It cannot be the first two digits because the date of birth is in YYMMDD format. If the first six digits represent the date of birth, the number of children he has must be either 25 or 65. Clearly, this is not possible. Therefore, the format of his social security number is NNYYMMDDWW.

For Karthik, the month of his birth can be either the 3rd and 4th digits OR the 5th and 6th digits. But it can't be 3rd and 4th digits because February in 82 does not have 29 days. Therefore, the SS number is in the format WWNNYYMMDD.

For Dhruv, the month of his birth has to be 04. Hence his SS number is of the format YYMMDDNNWW.

Name	Date of Birth	Weight	Number of Children
Rahul	24/04/1931	72	6
Ramesh	25/10/1912	65	11
Karthik	14/02/1929	82	2
Dhruv	24/04/1956	78	1

Rakesh's SS Number is 8412201224. The month of his birth can be either the 3rd and 4th digits or the 7th and 8th digits. Same is the case with the number of children he has. In either case, he has 12 children, which is more than any of the other four. Therefore, Rakesh has the maximum number of children.

Choice (B)

DIRECTIONS for questions 13 to 16: Answer these questions on the basis of the information given below.

Rajesh, who was a watchman for an ATM, discreetly observed the Personal Identification Numbers (PIN) of four customers – A, B, C and D – when they entered their PINs in the ATM. The PIN of each customer comprised four digits. Rajesh discreetly noted down the PIN of each of the four customers but he misplaced this information. However, he remembered the total number of times each digit was pressed by the four customers combined while entering their respective PINs. The following table presents this information:

Digit	0	1	2	3	4	5	6	7	8	9
Number of times	2	3	1	2	0	3	2	1	1	1

Further, Rajesh also recalled the following information:

- i. The PIN of each of the four customers is a multiple of 5.
- ii. Except for the PIN of B, all the other PINs have at least three distinct digits.
- iii. The PIN of C is numerically the highest among the four PINs.
- iv. The PIN of A has four distinct digits, three of which are not present in the PINs of any of the other three customers.
- v. The difference between the PIN of A and the PIN of D is at least 500 and at most 600.
- vi. The PIN of C is an exact multiple of the PIN of B
- vii. The sum of the digits in the PIN of B is 8.

Q13. DIRECTIONS *for questions 13 to 16*: Type in your answer in the input box provided below the question.

What is the PIN of B?

Given that the PIN number of B has less than 3 distinct digits. It cannot have only one distinct digit (since no digit occurs 4 times). Hence, the PIN of B must be a multiple of 5 (i.e., end in a 0 or a 5) and have 2 distinct digits, i.e., be of the form (aaab/abbb) OR (aabb). Hence, $3a + b = 8$ (for which the only possibility is $a = 1$ and $b = 5$, since 0 appears only twice) OR $2a + 2b = 8$ (for which there is no possibility, since 4 does not appear even once and at least one of a, b must be 0 or 5). Hence, only **1115** is possible.

The PIN of C is a multiple of PIN of B. Multiples of 1115 with four digits are 2230, 3345, 4460, 5575, 6690, 7805 and 8920. Of these only **6690** is possible (8920 and 7805 are not possible because the PIN of A should have three digits which are not in anyone else's PIN i.e., the PIN of A should have three digits from 2, 7, 8 and 9).

Since 9 is present in PIN of C, A should have 2, 7, 8 and 5/0. The PIN of D will have the digits 3, 3, 5 and 5/0. But if there are two 5's in PIN of D, it will not have at least three distinct digits. Hence, the PIN of D will have the digits 3, 3, 5 and 0. If the PIN of A starts with 7 or 8, there is no possibility where the difference between the PIN of A and B is less than 600. Hence, the PIN of A will be either 2785 or 2875.

From (v), $2785 + 500 = 3285$ and $2875 + 500 = 3375$. The PIN of D should lie between 3285 and 3475. The only possible values for PIN of D are 3350 and 3305. Since both these values are less than 3375, the PIN of A cannot be 2875. Therefore, the PIN of A must be **2785** and the PIN of D can be **3350 or 3305**.

The PIN number of B is 1115.

Ans: (1115)

Q14. DIRECTIONS for questions 13 to 16: Type in your answer in the input box provided below the question.

How many of the four PINs are multiples of 3?

Given that the PIN number of B has less than 3 distinct digits. It cannot have only one distinct digit (since no digit occurs 4 times). Hence, the PIN of B must be a multiple of 5 (i.e., end in a 0 or a 5) and have 2 distinct digits, i.e., be of the form (aaab/abbb) OR (aabb). Hence, $3a + b = 8$ (for which the only possibility is $a = 1$ and $b = 5$, since 0 appears only twice) OR $2a + 2b = 8$ (for which there is no possibility, since 4 does not appear even once and at least one of a, b must be 0 or 5). Hence, only **1115** is possible.

The PIN of C is a multiple of PIN of B. Multiples of 1115 with four digits are 2230, 3345, 4460, 5575, 6690, 7805 and 8920. Of these only **6690** is possible (8920 and 7805 are not possible because the PIN of A should have three digits which are not in anyone else's PIN i.e., the PIN of A should have three digits from 2, 7, 8 and 9).

Since 9 is present in PIN of C, A should have 2, 7, 8 and 5/0. The PIN of D will have the digits 3, 3, 5 and 5/0. But if there are two 5's in PIN of D, it will not have at least three distinct digits. Hence, the PIN of D will have the digits 3, 3, 5 and 0. If the PIN of A starts with 7 or 8, there is no possibility where the difference between the PIN of A and B is less than 600. Hence, the PIN of A will be either 2785 or 2875.

From (v), $2785 + 500 = 3285$ and $2875 + 500 = 3375$. The PIN of D should lie between 3285 and 3475. The only possible values for PIN of D are 3350 and 3305. Since both these values are less than 3375, the PIN of A cannot be 2875. Therefore, the PIN of A must be **2785** and the PIN of D can be **3350 or 3305**.

Only PIN of C is a multiple of 3.

Ans: (1)

Q15. DIRECTIONS for questions 13 to 16: Type in your answer in the input box provided below the question.

What is the sum of the PINs of A and C? (Type in the number 0, if the answer cannot be determined)

Given that the PIN number of B has less than 3 distinct digits. It cannot have only one distinct digit (since no digit occurs 4 times). Hence, the PIN of B must be a multiple of 5 (i.e., end in a 0 or a 5) and have 2 distinct digits, i.e., be of the form (aaab/abbb) OR (aabb). Hence, $3a + b = 8$ (for which the only possibility is $a = 1$ and $b = 5$, since 0 appears only twice) OR $2a + 2b = 8$ (for which there is no possibility, since 4 does not appear even once and at least one of a, b must be 0 or 5). Hence, only **1115** is possible.

The PIN of C is a multiple of PIN of B. Multiples of 1115 with four digits are 2230, 3345, 4460, 5575, 6690, 7805 and 8920. Of these only **6690** is possible (8920 and 7805 are not possible because the PIN of A should have three digits which are not in anyone else's PIN i.e., the PIN of A should have three digits from 2, 7, 8 and 9).

Since 9 is present in PIN of C, A should have 2, 7, 8 and 5/0. The PIN of D will have the digits 3, 3, 5 and 5/0. But if there are two 5's in PIN of D, it will not have at least three distinct digits. Hence, the PIN of D will have the digits 3, 3, 5 and 0. If the PIN of A starts with 7 or 8, there is no possibility where the difference between the PIN of A and B is less than 600. Hence, the PIN of A will be either 2785 or 2875.

From (v), $2785 + 500 = 3285$ and $2875 + 500 = 3375$. The PIN of D should lie between 3285 and 3475. The only possible values for PIN of D are 3350 and 3305. Since both these values are less than 3375, the PIN of A cannot be 2875. Therefore, the PIN of A must be **2785** and the PIN of D can be **3350 or 3305**.

The sum of the PIN numbers of A and C is 9475.

Ans: (9475)

Q16. DIRECTIONS for questions 13 to 16: Type in your answer in the input box provided below the question.

If two out of the four PINs are multiples of 10, what is the PIN of D? (Type in the number 0, if the answer cannot be determined)

Given that the PIN number of B has less than 3 distinct digits. It cannot have only one distinct digit (since no digit occurs 4 times). Hence, the PIN of B must be a multiple of 5 (i.e., end in a 0 or a 5) and have 2 distinct digits, i.e., be of the form (aaab/abbb) OR (aabb). Hence, $3a + b = 8$ (for which the only possibility is $a = 1$ and $b = 5$, since 0 appears only twice) OR $2a + 2b = 8$ (for which there is no possibility, since 4 does not appear even once and at least one of a, b must be 0 or 5). Hence, only **1115** is possible.

The PIN of C is a multiple of PIN of B. Multiples of 1115 with four digits are 2230, 3345, 4460, 5575, 6690, 7805 and 8920. Of these only **6690** is possible (8920 and 7805 are not possible because the PIN of A should have three digits which are not in anyone else's PIN i.e., the PIN of A should have three digits from 2, 7, 8 and 9).

Since 9 is present in PIN of C, A should have 2, 7, 8 and 5/0. The PIN of D will have the digits 3, 3, 5 and 5/0. But if there are two 5's in PIN of D, it will not have at least three distinct digits. Hence, the PIN of D will have the digits 3, 3, 5 and 0. If the PIN of A starts with 7 or 8, there is no possibility where the difference between the PIN of A and B is less than 600. Hence, the PIN of A will be either 2785 or 2875.

From (v), $2785 + 500 = 3285$ and $2875 + 500 = 3375$. The PIN of D should lie between 3285 and 3475. The only possible values for PIN of D are 3350 and 3305. Since both these values are less than 3375, the PIN of A cannot be 2875. Therefore, the PIN of A must be **2785** and the PIN of D can be **3350 or 3305**.

The PIN number of D must be 3350.

Ans: (3350)

DIRECTIONS for questions 17 to 20: Answer these questions on the basis of the information given below.

Each of five persons – Tarun, Unnath, Varun, Wasim and Yasar – plays a different sport among Tennis, Cricket, Hockey, Basketball and Badminton. Each person is from a different country among England, France, Spain, Germany and Belgium and each person endorses a different brand among Nike, ESPN, Gatorade, Under Armour and New Balance. Further, each of the five persons, while playing, wears a shirt of a different colour among Blue, Green, Yellow, Red and White. It is also known that

- i. the person who is from England does not wear a Red shirt and the person who endorses Nike does not play Hockey.
- ii. Tarun, who plays Basketball, does not endorse Under Armour and the person from Belgium plays Tennis.
- iii. the person from Germany does not play Cricket.
- iv. Yasar, who endorses Gatorade, does not play Badminton and the person who endorses New Balance wears a White shirt.
- v. Unnath plays Hockey and Varun, who is from Spain, wears a Green shirt.

vi. the person who plays Cricket does not wear a Green shirt but endorses ESPN and the person from France wears a Blue shirt and endorses Under Armour.

Q17. DIRECTIONS *for questions 17 to 20*: Select the correct alternative from the given choices.
Which country is Tarun from?

- a) **Germany**
- b) **England**
- c) **France**
- d) **Cannot be determined**

From (ii), Tarun plays Basketball. From (iv), Yasar endorses Gatorade. From (v), Unnath plays Hockey and Varun is from Spain and wears a green shirt.

From (vi), Varun cannot play Cricket (since he wears a Green shirt). Yasar also cannot play Cricket (since he cannot endorse ESPN). Hence, Wasim must play Cricket and endorse ESPN.

From (iv), Yasar does not play Badminton. Hence, Yasar plays Tennis and Varun plays Badminton.

From (i), Unnath does not endorse Nike (since he plays Hockey). From (ii), Tarun does not endorse Under Armour.

From (vi), the person from France cannot be Tarun (since he cannot endorse Under Armour) and it also cannot be Varun (he is from Spain) or Wasim (he endorses ESPN) or Yasar (he endorses Gatorade). Hence, Unnath must be from France, wears Blue shirt and endorses Under Armour. From (iv), the person who endorses New Balance wears a White shirt. This can only be Tarun. Varun endorses Nike.

From (ii), Yasar is from Belgium and from (iii), Wasim is not from Germany (since he plays Cricket). Hence, Wasim must be from England and Tarun must be from Germany. Since Wasim cannot be wearing a Red shirt, Yasar will wear a Red shirt and Wasim, a Yellow shirt.

The following table presents the distribution:

Person	Country	Brand	Sport	Colour
Tarun	Germany	New Balance	Basketball	White
Unnath	France	Under Armour	Hockey	Blue
Varun	Spain	Nike	Badminton	Green
Wasim	England	ESPN	Cricket	Yellow
Yasar	Belgium	Gatorade	Tennis	Red

Tarun is from Germany.

Choice (A)

Q18. DIRECTIONS for questions 17 to 20: Select the correct alternative from the given choices.
Which brand is endorsed by the person who plays Tennis?

- a) New Balance
- b) Under Armour
- c) Gatorade
- d) Nike

From (ii), Tarun plays Basketball. From (iv), Yasar endorses Gatorade. From (v), Unnath plays Hockey and Varun is from Spain and wears a green shirt.

From (vi), Varun cannot play Cricket (since he wears a Green shirt). Yasar also cannot play Cricket (since he cannot endorse ESPN). Hence, Wasim must play Cricket and endorse ESPN.

From (iv), Yasar does not play Badminton. Hence, Yasar plays Tennis and Varun plays Badminton.

From (i), Unnath does not endorse Nike (since he plays Hockey). From (ii), Tarun does not endorse Under Armour.

From (vi), the person from France cannot be Tarun (since he cannot endorse Under Armour) and it also cannot be Varun (he is from Spain) or Wasim (he endorses ESPN) or Yasar (he endorses Gatorade). Hence, Unnath must be from France, wears Blue shirt and endorses Under Armour. From (iv), the person who endorses New Balance wears a White shirt. This can only be Tarun. Varun endorses Nike.

From (ii), Yasar is from Belgium and from (iii), Wasim is not from Germany (since he plays Cricket). Hence, Wasim must be from England and Tarun must be from Germany. Since Wasim cannot be wearing a Red shirt, Yasar will wear a Red shirt and Wasim, a Yellow shirt.

The following table presents the distribution:

Person	Country	Brand	Sport	Colour
Tarun	Germany	New Balance	Basketball	White
Unnath	France	Under Armour	Hockey	Blue
Varun	Spain	Nike	Badminton	Green
Wasim	England	ESPN	Cricket	Yellow
Yasar	Belgium	Gatorade	Tennis	Red

The person who plays Tennis (Yasar) endorsee Gatorade.

Choice (C)

Q19. DIRECTIONS for questions 17 to 20: Select the correct alternative from the given choices.
What is the colour of the shirt that the person from England wears?

- a) White
- b) Blue
- c) Green
- d) Yellow

From (ii), Tarun plays Basketball. From (iv), Yasar endorses Gatorade. From (v), Unnath plays Hockey and Varun is from Spain and wears a green shirt.

From (vi), Varun cannot play Cricket (since he wears a Green shirt). Yasar also cannot play Cricket (since he cannot endorse ESPN). Hence, Wasim must play Cricket and endorse ESPN.

From (iv), Yasar does not play Badminton. Hence, Yasar plays Tennis and Varun plays Badminton.

From (i), Unnath does not endorse Nike (since he plays Hockey). From (ii), Tarun does not endorse Under Armour.

From (vi), the person from France cannot be Tarun (since he cannot endorse Under Armour) and it also cannot be Varun (he is from Spain) or Wasim (he endorses ESPN) or Yasar (he endorses Gatorade). Hence, Unnath must be from France, wears Blue shirt and endorses Under Armour. From (iv), the person who endorses New Balance wears a White shirt. This can only be Tarun. Varun endorses Nike.

From (ii), Yasar is from Belgium and from (iii), Wasim is not from Germany (since he plays Cricket). Hence, Wasim must be from England and Tarun must be from Germany. Since Wasim cannot be wearing a Red shirt, Yasar will wear a Red shirt and Wasim, a Yellow shirt.

The following table presents the distribution:

Person	Country	Brand	Sport	Colour
Tarun	Germany	New Balance	Basketball	White
Unnath	France	Under Armour	Hockey	Blue
Varun	Spain	Nike	Badminton	Green
Wasim	England	ESPN	Cricket	Yellow
Yasar	Belgium	Gatorade	Tennis	Red

The person from England (Wasim) wears a Yellow shirt.

Choice (D)

Q20. DIRECTIONS for questions 17 to 20: Select the correct alternative from the given choices.

The person who plays Hockey is from

- a) England.
- b) Belgium.
- c) France.
- d) Germany.

From (ii), Tarun plays Basketball. From (iv), Yasar endorses Gatorade. From (v), Unnath plays Hockey and Varun is from Spain and wears a green shirt.

From (vi), Varun cannot play Cricket (since he wears a Green shirt). Yasar also cannot play Cricket (since he cannot endorse ESPN). Hence, Wasim must play Cricket and endorse ESPN.

From (iv), Yasar does not play Badminton. Hence, Yasar plays Tennis and Varun plays Badminton.

From (i), Unnath does not endorse Nike (since he plays Hockey). From (ii), Tarun does not endorse Under Armour.

From (vi), the person from France cannot be Tarun (since he cannot endorse Under Armour) and it also cannot be Varun (he is from Spain) or Wasim (he endorses ESPN) or Yasar (he endorses Gatorade). Hence, Unnath must be from France, wears Blue shirt and endorses Under Armour. From (iv), the person who endorses New Balance wears a White shirt. This can only be Tarun. Varun endorses Nike.

From (ii), Yasar is from Belgium and from (iii), Wasim is not from Germany (since he plays Cricket). Hence, Wasim must be from England and Tarun must be from Germany. Since Wasim cannot be wearing a Red shirt, Yasar will wear a Red shirt and Wasim, a Yellow shirt.

The following table presents the distribution:

Person	Country	Brand	Sport	Colour
Tarun	Germany	New Balance	Basketball	White
Unnath	France	Under Armour	Hockey	Blue
Varun	Spain	Nike	Badminton	Green
Wasim	England	ESPN	Cricket	Yellow
Yasar	Belgium	Gatorade	Tennis	Red

The person who plays Hockey (Unnath) is from France.

Choice (C)

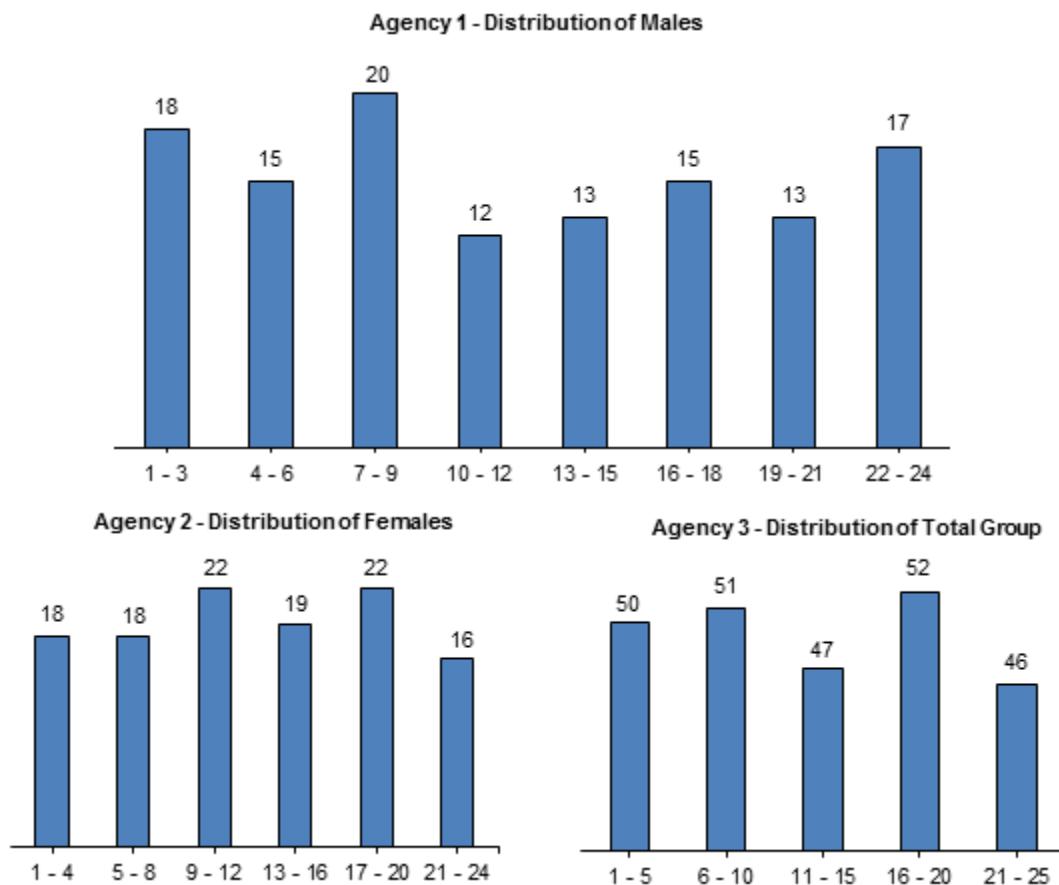
DIRECTIONS for questions 21 to 24: Answer the questions on the basis of the information given below.

Three different agencies researched on how often a group of people went to the movies in a certain month. All three agencies conducted their research on exactly the same group of people during the same month. However, among these three agencies, the first agency collected information on only males, the second agency collected information on only females and the third agency collected information on the entire group, i.e., both males and females.

It is known that, in the entire group, there are at least four persons from each gender who went to the movies any given number of times in the month. That is, for any given n , there are at least four

females and at least four males who went to the movies n times in the month. Further, it is known that every person in the group went to the movies at least once and at most 25 times during the month.

The following charts give the information regarding the number of males, number of females, and the total number of persons, classified by the number of times they went to the movies in the month. For example, the first agency found that there were 15 males who went to the movies at least four times and at most six times in the month.



Q21. DIRECTIONS for questions 21 to 24: Select the correct alternative from the given choices.
If the number of females who went to the movies at least six times during the month is 96, how many males went to the movies exactly six times during the month?

a) 6

- b) 5
- c) 4
- d) 7

Let X represent the gender (male, female, or total) and Y represent the number of times gender X went to the movies during that month, $N(X,Y)$ represents the number of people for a combination of X and Y .

Number of people who went to the movies exactly 25 times

$$= \text{Total Number of people} - \text{Males who went at most 24 times} - \text{Females who went at most 24 times} = 8$$

Therefore, number of females who went to the movies 25 times = 4 (since there has to be at least 4)

Therefore, number of males who went to the movies 25 times is 4.

Number of males who went to the movies exactly six times $N(\text{Males}, 6) = \text{Number of people who went to the movies at least six times} - (\text{Number of males who went to the movies at least seven times} + \text{number of females who went to the movies at least six times})$

$$= N(\text{Total}, 6 - 25) - (N(\text{Males}, 7 - 25) + N(\text{Female}, 6 - 25))$$

From the graph, we can observe that $N(\text{Total}, 6 - 25) = 51 + 47 + 52 + 46$

Similarly, the required value = $(51 + 47 + 52 + 46) - (20 + 12 + 13 + 15 + 13 + 17 + 10) + 96$

$$= 196 - (94 + 96) = 6.$$

Choice (A)

Q22. DIRECTIONS for questions 21 to 24: Select the correct alternative from the given choices.
How many females went to the movies exactly 16 times during the month?

- a) 5
- b) 6
- c) 7
- d) Cannot be determined

Let X represent the gender (male, female, or total) and Y represent the number of times gender X went to the movies during that month, $N(X,Y)$ represents the number of people for a combination of X and Y.

Number of people who went to the movies exactly 25 times

$$= \text{Total Number of people} - \text{Males who went at most 24 times} - \text{Females who went at most 24 times} = 8$$

Therefore, number of females who went to the movies 25 times = 4 (since there has to be at least 4)

Therefore, number of males who went to the movies 25 times is 4.

$$N(\text{Females}, 16) = N(\text{Total}, 16 - 25) - (N(\text{Males}, 16 - 25) + N(\text{Females}, 17 - 25))$$

$$= (52 + 46) - ((15 + 13 + 17 + 4) + (22 + 16 + 4))$$

$$= 98 - (49 + 42) = 7.$$

Choice (C)

Q23. DIRECTIONS for questions 21 to 24: Select the correct alternative from the given choices.

If the total number of people who went to the movies at most six times during the month is 59, how many males went to the movies exactly six times?

- a) 7
- b) 5
- c) 4
- d) Cannot be determined

Let X represent the gender (male, female, or total) and Y represent the number of times gender X went to the movies during that month, $N(X, Y)$ represents the number of people for a combination of X and Y .

Number of people who went to the movies exactly 25 times

= Total Number of people – Males who went at most 24 times – Females who went at most 24 times = 8

Therefore, number of females who went to the movies 25 times = 4 (since there has to be at least 4)

Therefore, number of males who went to the movies 25 times is 4.

$$N(\text{Males}, 6) = N(\text{Total}, 6) - N(\text{Females}, 6)$$

$$\begin{aligned}N(\text{Total}, 1 - 6) &= N(\text{Total}, 1 - 6) - N(\text{Total}, 1 - 5) \\&= 59 - 50 = 9.\end{aligned}$$

$$\begin{aligned}N(\text{Total}, 1 - 6) &= N(\text{Male}, 1 - 6) + N(\text{Female}, 1 - 6) \\&= (N(\text{Male}, 1 - 3) + N(\text{Male}, 4 - 6) + (N(\text{Female}, 1 - 4) + N(\text{Female}, 5) +\end{aligned}$$

$$N(\text{Female}, 6)$$

$$\Rightarrow 59 = (18 + 15) + (18 + N(\text{Female}, 5)) + N(\text{Female}, 6)$$

$$\Rightarrow N(\text{Female}, 5) + N(\text{Female}, 6) = 8.$$

$$\text{Hence, } N(\text{Female}, 5) = N(\text{Female}, 6) = 4$$

$$\therefore N(\text{Male}, 6) = 9 - 4 = 5$$

Choice (B)

Q24. DIRECTIONS for questions 21 to 24: Select the correct alternative from the given choices.

If X represents the gender and n represents the number of times that a person of gender X went to the movies during the month, then $N(X, n)$ represents the number of persons for a combination of given X and n . Which of the following pairs of values are definitely equal?

- a) **$N(\text{Male}, 22) \& N(\text{Female}, 16)$**
- b) **$N(\text{Male}, 21) \& N(\text{Female}, 21)$**
- c) **$N(\text{Male}, 14) \& N(\text{Female}, 16)$**
- d) **$N(\text{Male}, 20) \& N(\text{Female}, 14)$**

Let X represent the gender (male, female, or total) and Y represent the number of times gender X went to the movies during that month, $N(X,Y)$ represents the number of people for a combination of X and Y .

Number of people who went to the movies exactly 25 times

$$= \text{Total Number of people} - \text{Males who went at most 24 times} - \text{Females who went at most 24 times} = 8$$

Therefore, number of females who went to the movies 25 times = 4 (since there has to be at least 4)

Therefore, number of males who went to the movies 25 times is 4.

Choice (A) and Choice (C):

From previous question no.48, $N(\text{Female}, 16) = 7$

$N(\text{Male}, 22)$ and $N(\text{Male}, 14)$ can be at most 9. Since we cannot determine these values exactly, choice (A) and choice (C) are incorrect.

Choice (B):

Total number of people who went to the movies 25 times = 8

$$\text{Hence, } N(\text{Total}, 21 - 24) = 46 - 8 = 38$$

$$\begin{aligned}N(\text{Male}, 21 - 24) &= N(\text{Total}, 21 - 24) - N(\text{Female}, 21 - 24) \\&= 38 - 16 = 22\end{aligned}$$

$$N(\text{Male}, 22 - 24) = 17$$

$$\text{Hence, } N(\text{Male}, 21) = 22 - 17 = 5$$

$$N(\text{Male}, 21) = 5 \text{ and } N(\text{Female}, 21) = 4$$

\therefore Choice (B) is incorrect.

Choice (D):

Since, $N(\text{Male}, 21) = 5$, $N(\text{Female}, 19 - 20) = 13 - 5 = 8$.

$$\text{Hence, } N(\text{Male}, 19) = N(\text{Male}, 20) = 4$$

$$\begin{aligned}\text{Since, } N(\text{Female}, 16) &= 7, N(\text{Female}, 13 - 15) = 19 - 7 \\&= 12.\end{aligned}$$

$$\text{Hence, } N(\text{Female}, 13) = N(\text{Female}, 14) = N(\text{Female}, 15) = 4$$

\therefore Choice (D) is correct.

Choice (D)

DIRECTIONS for questions 25 to 28: Answer these questions on the basis of the information given below.

At the beginning of the year, Venky, a restaurant owner, installed, at the entrance to his restaurant, a gadget which counts the number of people who visit the restaurant. At the end of each day, the gadget displays the number of people who visited the restaurant during the day and the average number of people who visited the restaurant per day for the last five days (including that day). The following table presents the data displayed by the gadget at the end of the day for a few days between March 5th and March 20th:

Date	Number of people who visited	Average Number of people in the last five days
March 5 th	31	32.0
March 6 th	20	31.0
March 8 th	44	31.4
March 10 th	30	29.6
March 13 th	18	22.0
March 15 th	36	18.8
March 18 th	42	36.2
March 20 th	44	38.0

Further, it is also known that the number of people who visited the restaurant on March 7th is half the number of people who visited the restaurant on March 9th. Assume that no person visited the restaurant more than once during the above period.

Q25. DIRECTIONS *for question 25*: Type in your answer in the input box provided below the question.

How many people visited the restaurant on March 9th?

Let $n_1, n_2, n_3 \dots$ represent the number of people who visited the restaurant on March 1st, 2nd, 3rd ... respectively.

From March 5th data,

$$n_1 + n_2 + n_3 + n_4 + n_5 = 160 \text{ and } n_5 = 31$$

$$\text{Hence, } n_1 + n_2 + n_3 + n_4 = 129$$

From March 6th data,

$$n_2 + n_3 + n_4 + n_5 + n_6 = 155$$

$$\Rightarrow n_2 + n_3 + n_4 = 104 \text{ and } n_1 = 25$$

Similarly, from March 8th data,

$$n_4 + n_7 = 62$$

From March 10th data,

$$n_7 + n_9 = 54$$

From the given condition, $n_7 = 18$ and $n_9 = 36$.

$$\text{Hence, } n_4 = 44 \text{ and } n_2 + n_3 = 60$$

From March 13th data, $n_{11} + n_{12} = 26$

From March 15th data, $n_{15} + n_{14} + n_{13} + n_{12} + n_{11} = 94$

$$\Rightarrow n_{14} = 94 - 36 - 18 - 26 = 14$$

From March 18th data, $n_{16} + n_{17} = 89$

From March 20th data, $n_{19} = 15$ and $n_{20} = 44$.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of people	25	60	44	31	20	18	44	36	30	26	18	14	36	89	42	15	44			

36 people visited the restaurant on March 9th.

Ans: (36)

Q26. DIRECTIONS for question 26: Select the correct alternative from the given choices.

If the number of people who visited the restaurant on March 11th is less than that on March 14th, then which of the following can be the number of people who visited the restaurant on March 12th?

a) 11

b) 25

c) 35

d) 45

Let $n_1, n_2, n_3 \dots$ represent the number of people who visited the restaurant on March 1st, 2nd, 3rd ... respectively.

From March 5th data,

$$n_1 + n_2 + n_3 + n_4 + n_5 = 160 \text{ and } n_5 = 31$$

$$\text{Hence, } n_1 + n_2 + n_3 + n_4 = 129$$

From March 6th data,

$$n_2 + n_3 + n_4 + n_5 + n_6 = 155$$

$$\Rightarrow n_2 + n_3 + n_4 = 104 \text{ and } n_1 = 25$$

Similarly, from March 8th data,

$$n_4 + n_7 = 62$$

From March 10th data,

$$n_7 + n_9 = 54$$

From the given condition, $n_7 = 18$ and $n_9 = 36$.

$$\text{Hence, } n_4 = 44 \text{ and } n_2 + n_3 = 60$$

From March 13th data, $n_{11} + n_{12} = 26$

From March 15th data, $n_{15} + n_{14} + n_{13} + n_{12} + n_{11} = 94$

$$\Rightarrow n_{14} = 94 - 36 - 18 - 26 = 14$$

From March 18th data, $n_{16} + n_{17} = 89$

From March 20th data, $n_{19} = 15$ and $n_{20} = 44$.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of people	25	60	44	31	20	18	44	36	30	26	18	14	36	89	42	15	44			

On March 14th, 14 people visited the restaurant. If the number of people who visited the restaurant on March 11th is less than 14, then the number of people who visited the restaurant on March 12th has to be at least 13 and at most 26. From the options, the answer is 25.

Choice (B)

Q27. DIRECTIONS for question 27: Type in your answer in the input box provided below the question.

How many people visited the restaurant from March 1st to March 20th?

Let $n_1, n_2, n_3 \dots$ represent the number of people who visited the restaurant on March 1st, 2nd, 3rd ... respectively.

From March 5th data,

$$n_1 + n_2 + n_3 + n_4 + n_5 = 160 \text{ and } n_5 = 31$$

$$\text{Hence, } n_1 + n_2 + n_3 + n_4 = 129$$

From March 6th data,

$$n_2 + n_3 + n_4 + n_5 + n_6 = 155$$

$$\Rightarrow n_2 + n_3 + n_4 = 104 \text{ and } n_1 = 25$$

Similarly, from March 8th data,

$$n_4 + n_7 = 62$$

From March 10th data,

$$n_7 + n_9 = 54$$

From the given condition, $n_7 = 18$ and $n_9 = 36$.

$$\text{Hence, } n_4 = 44 \text{ and } n_2 + n_3 = 60$$

From March 13th data, $n_{11} + n_{12} = 26$

From March 15th data, $n_{15} + n_{14} + n_{13} + n_{12} + n_{11} = 94$

$$\Rightarrow n_{14} = 94 - 36 - 18 - 26 = 14$$

From March 18th data, $n_{16} + n_{17} = 89$

From March 20th data, $n_{19} = 15$ and $n_{20} = 44$.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of people	25	60	44	31	20	18	44	36	30	26	18	14	36	89	42	15	44			

Total number of people who visited the restaurant = 592

Ans: (592)

Q28. DIRECTIONS for question 28: Select the correct alternative from the given choices.

Which of the following statements is definitely false?

- a) The lowest number of people visited the restaurant on March 11th.
- b) The lowest number of people visited the restaurant on March 12th.
- c) The highest number of people visited the restaurant on March 17th.
- d) The highest number of people visited the restaurant on March 4th.

Let $n_1, n_2, n_3 \dots$ represent the number of people who visited the restaurant on March 1st, 2nd, 3rd ... respectively.

From March 5th data,

$$n_1 + n_2 + n_3 + n_4 + n_5 = 160 \text{ and } n_5 = 31$$

$$\text{Hence, } n_1 + n_2 + n_3 + n_4 = 129$$

From March 6th data,

$$n_2 + n_3 + n_4 + n_5 + n_6 = 155$$

$$\Rightarrow n_2 + n_3 + n_4 = 104 \text{ and } n_1 = 25$$

Similarly, from March 8th data,

$$n_4 + n_7 = 62$$

From March 10th data,

$$n_7 + n_9 = 54$$

From the given condition, $n_7 = 18$ and $n_9 = 36$.

$$\text{Hence, } n_4 = 44 \text{ and } n_2 + n_3 = 60$$

From March 13th data, $n_{11} + n_{12} = 26$

From March 15th data, $n_{15} + n_{14} + n_{13} + n_{12} + n_{11} = 94$

$$\Rightarrow n_{14} = 94 - 36 - 18 - 26 = 14$$

From March 18th data, $n_{16} + n_{17} = 89$

From March 20th data, $n_{19} = 15$ and $n_{20} = 44$.

Day	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Number of people	25	60	44	31	20	18	44	36	30	26	18	14	36	89	42	15	44			

The number of people who visited the restaurant on March 4th = 44

But the number of people who visited the restaurant on March 16 and 17th combined is 89. Hence, one of these values will definitely be greater than 44. Therefore, the statement given in option D is definitely false.

Choice (D)

DIRECTIONS for questions 29 to 32: Answer these questions on the basis of the information given below.

A college coach took with him ten players – A through J – to a sports meet. He formed four teams with 4, 5, 6 and 7 players to play Badminton, Basketball, Dodgeball and Volleyball respectively.

Further, it is also known that

- i. no player who is part of the Badminton team can be a part of the Basketball team.
- ii. there are four players who are part of exactly three teams, four players who are part of exactly two teams and every player is part of at least one team.
- iii. A will be in any team if and only if E is also in that team.
- iv. J and H are not part of the Volleyball team and they are not together in any team.
- v. neither B nor C is in either the Badminton team or the Dodgeball team, but both of them are part of the other two teams.
- vi. G will always be in a team in which E is not present and vice versa.

vii. both D and H are part of the Basketball team.

Q29. DIRECTIONS for question 29: Type in your answer in the input box provided below the question.

In how many ways can the coach select the four teams?

From (v), J and H are not in the Volleyball team. From (iii) and (vi), if G is in the Volleyball team, both A and E cannot be in the team. Then, there cannot be 7 members in the Volleyball team. Hence, G is not in the Volleyball team. All the remaining players will be in the Volleyball team.

From (v), B and C are in Basketball and Volleyball teams. From (vii), D and H are also in Basketball team. A and E cannot be in Basketball team together because the size of this team is only 5. From (vi), G is a part of the Basketball team. Hence, B, C, D, G and H are in the Basketball team. These players cannot be in Badminton team from (i).

If G is in the Dodgeball team, A and E cannot be in the Dodgeball team. Since B and C are not a part of this team, all the other members should be a part of this team. However, this will violate (iv), since J and H have to be in this team together. Therefore, G is not in the Dodgeball team. A and E both are in this team. Between J and H, one person will be in this team and all the others will also be in the team. Therefore, the Dodgeball team will comprise A, D, E, F, I and J/H.

From (ii), it can be inferred that two players are in only one team.

A and E will also be a part of badminton team from (vi). Hence, A and E will be in three teams. B and C will be in two teams. D will also be in three teams. G can only be in the Basketball team. Between F, H, I and J, one has to be in three teams, two have to be in two teams, one person has to be in only one team. The person who has to be in one team cannot be F (already in Dodgeball and Volleyball teams) or I (already in Dodgeball and Volleyball teams). This can only be H or J. If J is in two teams, he has to be in Dodgeball and Badminton teams. If J is in one team, he has to be in Badminton team (if he is only in Dodgeball team, H cannot be in Dodgeball team and he can then be in only one team as well which is not possible). Hence, J is anyway a part of Badminton team.

The following table presents the possibilities:

Sport	Teams
Badminton	A, E, J, F/I
Basketball	B, C, D, G, H
Dodgeball	A, D, E, F, I, H/J
Volleyball	A, B, C, D, E, F, I

The coach could have selected the four teams in four ways.

Ans: (4)

Q30. DIRECTIONS for questions 30 and 31: Select the correct alternative from the given choices.

Who among the following is definitely part of three teams?

a) D

b) F

c) G

d) J

From (v), J and H are not in the Volleyball team. From (iii) and (vi), if G is in the Volleyball team, both A and E cannot be in the team. Then, there cannot be 7 members in the Volleyball team. Hence, G is not in the Volleyball team. All the remaining players will be in the Volleyball team.

From (v), B and C are in Basketball and Volleyball teams. From (vii), D and H are also in Basketball team. A and E cannot be in Basketball team together because the size of this team is only 5. From (vi), G is a part of the Basketball team. Hence, B, C, D, G and H are in the Basketball team. These players cannot be in Badminton team from (i).

If G is in the Dodgeball team, A and E cannot be in the Dodgeball team. Since B and C are not a part of this team, all the other members should be a part of this team. However, this will violate (iv), since J and H have to be in this team together. Therefore, G is not in the Dodgeball team. A and E both are in this team. Between J and H, one person will be in this team and all the others will also be in the team. Therefore, the Dodgeball team will comprise A, D, E, F, I and J/H.

From (ii), it can be inferred that two players are in only one team.

A and E will also be a part of badminton team from (vi). Hence, A and E will be in three teams. B and C will be in two teams. D will also be in three teams. G can only be in the Basketball team. Between F, H, I and J, one has to be in three teams, two have to be in two teams, one person has to be in only one team. The person who has to be in one team cannot be F (already in Dodgeball and Volleyball teams) or I (already in Dodgeball and Volleyball teams). This can only be H or J. If J is in two teams, he has to be in Dodgeball and Badminton teams. If J is in one team, he has to be in Badminton team (if he is only in Dodgeball team, H cannot be in Dodgeball team and he can then be in only one team as well which is not possible). Hence, J is anyway a part of Badminton team.

The following table presents the possibilities:

Sport	Teams
Badminton	A, E, J, F/I
Basketball	B, C, D, G, H
Dodgeball	A, D, E, F, I, H/J
Volleyball	A, B, C, D, E, F, I

D is definitely a part of three teams.

Choice (A)

Q31. DIRECTIONS for questions 30 and 31: Select the correct alternative from the given choices.

If everyone who is part of the Badminton team is also in the Dodgeball team, who among the following was part of exactly one team?

a) J

b) H

c) I

d) None of the above

From (v), J and H are not in the Volleyball team. From (iii) and (vi), if G is in the Volleyball team, both A and E cannot be in the team. Then, there cannot be 7 members in the Volleyball team. Hence, G is not in the Volleyball team. All the remaining players will be in the Volleyball team.

From (v), B and C are in Basketball and Volleyball teams. From (vii), D and H are also in Basketball team. A and E cannot be in Basketball team together because the size of this team is only 5. From (vi), G is a part of the Basketball team. Hence, B, C, D, G and H are in the Basketball team. These players cannot be in Badminton team from (i).

If G is in the Dodgeball team, A and E cannot be in the Dodgeball team. Since B and C are not a part of this team, all the other members should be a part of this team. However, this will violate (iv), since J and H have to be in this team together. Therefore, G is not in the Dodgeball team. A and E both are in this team. Between J and H, one person will be in this team and all the others will also be in the team. Therefore, the Dodgeball team will comprise A, D, E, F, I and J/H.

From (ii), it can be inferred that two players are in only one team.

A and E will also be a part of badminton team from (vi). Hence, A and E will be in three teams. B and C will be in two teams. D will also be in three teams. G can only be in the Basketball team. Between F, H, I and J, one has to be in three teams, two have to be in two teams, one person has to be in only one team. The person who has to be in one team cannot be F (already in Dodgeball and Volleyball teams) or I (already in Dodgeball and Volleyball teams). This can only be H or J. If J is in two teams, he has to be in Dodgeball and Badminton teams. If J is in one team, he has to be in Badminton team (if he is only in Dodgeball team, H cannot be in Dodgeball team and he can then be in only one team as well which is not possible). Hence, J is anyway a part of Badminton team.

The following table presents the possibilities:

Sport	Teams
Badminton	A, E, J, F/I
Basketball	B, C, D, G, H
Dodgeball	A, D, E, F, I, H/J
Volleyball	A, B, C, D, E, F, I

J will be a part of two teams. H will be in only one team.

Choice (B)

Q32. DIRECTIONS for question 32: Type in your answer in the input box provided below the question.

How many players are part of both the Basketball team and the Volleyball team?

From (v), J and H are not in the Volleyball team. From (iii) and (vi), if G is in the Volleyball team, both A and E cannot be in the team. Then, there cannot be 7 members in the Volleyball team. Hence, G is not in the Volleyball team. All the remaining players will be in the Volleyball team.

From (v), B and C are in Basketball and Volleyball teams. From (vii), D and H are also in Basketball team. A and E cannot be in Basketball team together because the size of this team is only 5. From (vi), G is a part of the Basketball team. Hence, B, C, D, G and H are in the Basketball team. These players cannot be in Badminton team from (i).

If G is in the Dodgeball team, A and E cannot be in the Dodgeball team. Since B and C are not a part of this team, all the other members should be a part of this team. However, this will violate (iv), since J and H have to be in this team together. Therefore, G is not in the Dodgeball team. A and E both are in this team. Between J and H, one person will be in this team and all the others will also be in the team. Therefore, the Dodgeball team will comprise A, D, E, F, I and J/H.

From (ii), it can be inferred that two players are in only one team.

A and E will also be a part of badminton team from (vi). Hence, A and E will be in three teams. B and C will be in two teams. D will also be in three teams. G can only be in the Basketball team. Between F, H, I and J, one has to be in three teams, two have to be in two teams, one person has to be in only one team. The person who has to be in one team cannot be F (already in Dodgeball and Volleyball teams) or I (already in Dodgeball and Volleyball teams). This can only be H or J. If J is in two teams, he has to be in Dodgeball and Badminton teams. If J is in one team, he has to be in Badminton team (if he is only in Dodgeball team, H cannot be in Dodgeball team and he can then be in only one team as well which is not possible). Hence, J is anyway a part of Badminton team.

The following table presents the possibilities:

Sport	Teams
Badminton	A, E, J, F/I
Basketball	B, C, D, G, H
Dodgeball	A, D, E, F, I, H/J
Volleyball	A, B, C, D, E, F, I

Three players – B, C and D – were a part of both the teams.

Ans: (3)

QA

Q1. DIRECTIONS for questions 1 to 6: Select the correct alternative from the given choices.
In a huge pile of bananas and chikus, 60% of the fruits were ripe. If 55% of the chikus were not ripe and 70% of the bananas were ripe, find the ratio of the number of bananas and chikus present in the pile.

- a) 3 : 2
- b) 2 : 3
- c) 3 : 4
- d) 4 : 3

Let the number of bananas and chikus present in the pile be x and y respectively.

Using the number of fruits that were ripe,

$$70\% x + 45\% y = 60\% (x + y)$$

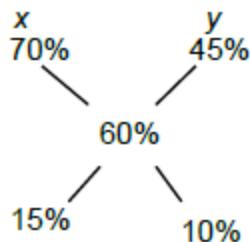
$$10\% x = 15\% y$$

$$\frac{x}{y} = \frac{3}{2}$$

Alternative Solution:

The alligations approach can directly be applied as shown below:

Let the number of bananas and chikus be x and y respectively



$$\therefore \frac{x}{y} = \frac{15}{10} = \frac{3}{2}$$

Choice (A)

Q2. DIRECTIONS for questions 1 to 6: Select the correct alternative from the given choices.

The solution set of the inequality $\log_{20}(x^2 - 25) < \log_{20}(13x - 55)$ is

- a) (5, 15).
- b) (3, 10).
- c) (5, 10).
- d) (-2, 15).

$$\log_{20}(x^2 - 25) < \log_{20} (13x - 55), \text{ when } 13x - 55 > x^2 - 25$$

$$\Rightarrow x^2 - 13x + 30 < 0$$

$$\Rightarrow (x - 3)(x - 10) < 0$$

$$\Rightarrow x \in (3, 10)$$

But $\log_{20}(x^2 - 25)$ is not defined for $x \in [-5, 5]$

$\Rightarrow \therefore$ The solution set of the inequality is (5, 10).

Choice (C)

Q3. DIRECTIONS for questions 1 to 6: Select the correct alternative from the given choices.

If the equation $9x + 13y = K$, has exactly five solutions, where x and y are positive integers, what is the minimum possible value of K ?

- a) 440
- b) 490
- c) 507
- d) 520

Let a be the minimum value of x when $9x + 13y = K$ has five solutions.

Let b be the value of y when $x = a$.

\therefore The rest of the solutions will be $(a + 13, b - 9)$, $(a + 26, b - 18)$, $(a + 39, b - 27)$ and $(a + 52, b - 36)$.

Since, x and y have to be positive integers, for K to be minimum we take $a = 1$ and $b - 36 = 1$

$$\Rightarrow a = 1 \text{ and } b = 37$$

$$\Rightarrow \text{The value of } K = 9(1) + 13(37) = 9 + 481 = 490.$$

Choice (B)

Q4. DIRECTIONS for questions 1 to 6: Select the correct alternative from the given choices.
A function $g(x, y)$ is defined as the two-digit number of the form $(10x + y)$. Another function $f(x, y, n) = xn + yn + 1$ is defined, where x, y and n are positive integers and $x, y \in (0, 9]$. How many sets of values (x, y, n) are possible such that $f(x, y, n) = g(x, y)$?

- a) 0
- b) 1
- c) 2
- d) 3

Here, we need to find two-digit numbers 'x y'
such $x y = xn + yn + 1$, i.e., $10x + y = xn + yn + 1$
 $x(10 - x^{n-1}) = y(y^n - 1) \quad \dots (1)$

From this equation, we can say that $x^{n-1} < 10$, $x \neq 0$, and $y \neq 0, 1$ [\because L.H.S $\neq 0$ and R.H.S $\neq 0$]

If $n = 1$:

Equation (1) becomes.

$$x(10 - 1) = y(y - 1) [\because x^0 = 1]$$

$$9x = y(y - 1)$$

For product of 2 consecutive single-digit numbers to be divisible by 9,

$$y = 9.$$

$$\therefore x y = 89$$

If $n = 2$:

Equation (1) becomes $x(10 - x) = y(y^2 - 1)$

The maximum value of $x (10 - x)$ can be 25 (when $x = 5$). So possible values of $y = 2, 3$.

Solving the above equation when $y = 3$, we get $x = 4$ or 6 .

$$\therefore x y = 43 \text{ (or) } 63.$$

($y = 2$ is not valid as the equation becomes $x(10 - x) = 6$, which is not possible)

For $n \geq 3$:

The equation can only be possible when $y = 2$

For other values y , $y(y^n - 1) > x(10 - x^{n-1})$

For $y = 2$, no value of x exists such that the value of $x(10 - x^{n-1})$ equal $y(y^{n-1})$.

\therefore There are 3 sets of values of $(x, y) = (8, 9, 1), (4, 3, 2), (6, 3, 2)$ Choice (D)

Q5. DIRECTIONS for questions 1 to 6: Select the correct alternative from the given choices.

Rahul invested Rs.10,000 at 10% p.a., simple interest, for three years and another Rs.10,000 at 8% p.a., interest compounded annually, for two years. How much will Rahul's investments be worth after two years?

- a) **Rs.24,552**
- b) **Rs.23,552**
- c) **Rs.23,664**
- d) **Rs.24,664**

₹10,000 at 10% simple interest for 2 years will result in ₹12,000.

₹10,000 at 8% compound interest for first year = ₹10,800

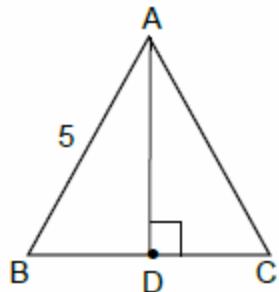
After second year = $10,800 \times 1.08 = 11,664$

Total amount after two years = $12,000 + 11,664 = ₹23,664$.

Choice (C)

Q6. DIRECTIONS for questions 1 to 6: Select the correct alternative from the given choices.
A triangle ABC is such that its longest side has a length of 10 cm and one of its sides has a length of 5 cm. What is the length of its third side, if the area of the triangle is 20 sq.cm?

- a) $\sqrt{65}$ cm
- b) $\sqrt{60}$ cm
- c) $\sqrt{260}$ cm
- d) $\sqrt{175}$ cm



Let $AB = 5$

and $BC = 10$

Draw a perpendicular from A to BC

$$\text{Now } \frac{1}{2} \times BC \times AD = \text{Area of } \triangle ABC = 20 = \frac{1}{2} \times 10 \times AD$$

$$\Rightarrow AD = 4$$

$$\therefore BD = \sqrt{AB^2 - AD^2}$$

$$= \sqrt{5^2 - 4^2} = 3$$

$$\therefore DC = BC - BD = 7$$

\therefore In $\triangle ADC$

$$AC = \sqrt{AD^2 + DC^2}$$

$$= \sqrt{4^2 + 7^2} = \sqrt{65}$$

Choice (A)

Note: In this case $\angle ACB$ is an acute angle. Say θ . These conditions will also be satisfied when $\angle ACB = 180^\circ - \theta$. But BC will not be the longest side.

Q7. DIRECTIONS for questions 7 and 8: Type in your answer in the input box provided below the question.

In a cricket match between India and Srilanka, Malinga, a Srilankan pace bowler, can bowl at most four overs out of 20 overs in the match. No bowler can bowl two consecutive overs. If it is known that the 20th over was bowled by Malinga, which was also his fourth over, then in how many ways could he have bowled the rest of his overs?

Let the number of overs bowled by others before Malinga bowled his first over be x_1 .

Let the number of overs bowled by others between his first and second over be x_2 .

Let the number of overs bowled by others between his second and third over be x_3 .

Let the number of overs bowled by others between his third and fourth over be x_4 .

$$\Rightarrow x_1 + x_2 + x_3 + x_4 = 20 - (4) = 16$$

Among x_1, x_2, x_3 and x_4 , only x_1 can be zero

∴ The number of ways in which Malinga could have bowled = $^{16+1-1}C_4 - 1 = {}^{16}C_3$

$$= \frac{16 \times 15 \times 14}{3 \times 2 \times 1} = 560$$

Ans: (560)

Q8. DIRECTIONS for questions 7 and 8: Type in your answer in the input box provided below the question.

For how many of the following values of k can $F(x) = (k + 10)x^2 + (k + 10)x - 9 = 0$ have equal roots?

- (i) -46 (ii) -25 (iii) -10 (iv) -3 (v) 10

For $F(x)$ to have equal roots $b^2 - 4ac$ must be equal to zero.

$$\text{i.e., } (k + 10)^2 = (4)(k + 10)(-9)$$

$$\Rightarrow (k + 10)(k + 46) = 0$$

$$\Rightarrow k = -46 \text{ or } -10.$$

However, if $k = -10$, then $F(x) = 0$ becomes $-9 = 0$, which is not possible.

Therefore, k can be only -46.

Ans: (1)

Q9. DIRECTIONS for questions 9 and 10: Select the correct alternative from the given choices.

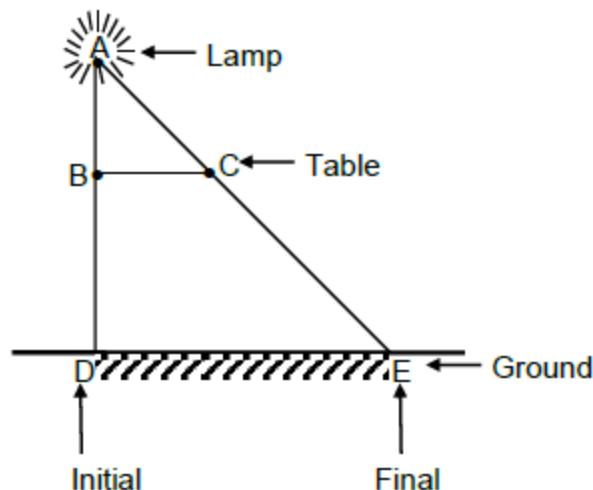
There is a glass table with a lamp placed directly above it, at a height of 50 cm above the surface of the table. An ant, initially directly below the lamp, starts moving on the surface of the glass table, at a speed of 10 cm/s. If the surface of the table is at a height of 100 cm above the ground, what is the speed of the ant's shadow falling on the ground below it?

a) 10 cm/s

b) 15 cm/s

c) 20 cm/s

d) 30 cm/s



Let A be the lamp, B and C be the initial and final positions of the ant on table after it moves through a distance of 10 cm.

Let D and E be the initial and final positions of the shadow of the ant on the ground.

$$BC = 10 \text{ cm}$$

$$AB = 50 \text{ cm}$$

$$BD = 100 \text{ cm}$$

Clearly, $\triangle ABC$ and $\triangle ADE$ are similar triangles.

$$\therefore \frac{AB}{AD} = \frac{BC}{DE}$$

$$\Rightarrow \frac{50}{150} = \frac{10}{DE}$$

$$DE = 30 \text{ cm.}$$

i.e., in the time in which the ant travels 10 cm on the table, its shadow travels a distance of 30 cm on the ground.

$$\therefore \text{Speed of shadow} = 30 \text{ cm/sec}$$

Choice (D)

Q10. DIRECTIONS for questions 9 and 10: Select the correct alternative from the given choices.

$$\begin{array}{c}
 \overline{6} \\
 \overline{4+} \quad \overline{6} \\
 \sqrt{2+} \quad \sqrt{4+\overline{2+.....\infty}}
 \end{array}$$

If $x = \sqrt{4+\sqrt{2+.....\infty}}$, find the value of x .

a) 2

b) $\frac{9 - \sqrt{33}}{2}$

c) 1

d) $\frac{9 - \sqrt{33}}{4}$

$$x = \sqrt{\frac{6}{4 + \frac{6}{2+x}}} \text{ . Hence } x = \sqrt{\frac{12+6x}{14+4x}}$$

$$\text{squaring both sides, } x^2 = \left(\frac{12+6x}{14+4x} \right)$$

$$\Rightarrow 14x^3 + 14x^2 + -6x - 12 = 0$$

$$\text{Let } f(x) = 4x^3 + 14x^2 - 6x - 12 = 0$$

$$f(-1) = 0. \text{ Hence } x - 1 \text{ is a factor of } f(x)$$

Dividing $f(x)$ by $x - 1$, the other factor is $4x^2 + 18x + 12$.

$$\text{Hence } (x - 1)(4x^2 + 18x + 12) = 0$$

$$x = +1 \text{ or } \frac{-18 \pm 2\sqrt{33}}{2(4)} = +1 \text{ or } \frac{-9 \pm \sqrt{33}}{4}$$

As $x > 0$, $x = 1$.

Alternative Solution:

Once, we see that $x = \frac{6}{4 + \frac{6}{2+x}}$, we can quickly check for any easy option, such as

option (C), i.e., $x = 1$. It can be easily observed that $x = 1$ satisfies. Hence, option (C).
Choice (C)

Q11. DIRECTIONS for questions 11 and 12: Type in your answer in the input box provided below the question.

What is the remainder when 40135 is divided by 11?

$$\text{Rem}\left(\frac{40^{135}}{11}\right) = \text{Rem}\left(\frac{\left(\text{Rem}\left(\frac{40}{11}\right)\right)^{135}}{11}\right) = \text{Rem}\left(\frac{7^{135}}{11}\right)$$

Now, the remainders of successive powers of 7 when divided by 11 can be found to be 7, 5, 2, 3, -1, ... and so on. Therefore, 7^5 leaves a remainder of -1, when divided by 11.

$$\text{Hence, } \text{Rem}\left(\frac{7^{135}}{11}\right) = \text{Rem}\left(\frac{(7^5)^{27}}{11}\right) = (-1)^{27} = -1$$

Therefore, required remainder = $11 - 1 = 10$

Ans: (10)

Q12. DIRECTIONS for questions 11 and 12: Type in your answer in the input box provided below the question.

If each of the three ratios, $\frac{p-q+r}{q}$, $\frac{q-r+p}{r}$ and $\frac{r-p+q}{p}$, is equal to R, find the sum of all the possible values of R.

Each of the given expressions must be $\frac{p-q+r+q-r+p+r-p+q}{q+r+p} = 1$, if $q + r + p \neq 0$.

If $q + r + p = 0$, $r + p = -q$.

In this case, each of them must be $\frac{r+p-q}{q} = \frac{-q-q}{q} = -2$

\therefore Each of them is 1 or -2.

Required sum = $1 - 2 = -1$

Ans: (-1)

Q13. DIRECTIONS for question 13: Select the correct alternative from the given choices.

There are a total of 40 employees in a manufacturing unit. They are divided into three groups X, Y and Z, depending upon their work timings. The salary of each employee in the groups X, Y and Z is Rs.4,000, Rs.6,000 and Rs.9,000 respectively. If the total salary paid to the employees of these three groups is Rs.3,00,000, which among the following can be the absolute difference in the number of employees in department Y and department X?

a) 3

b) 12

c) 6

d) 8

Let the number of employees in X, Y and Z departments be x , y and z respectively.

$$x + y + z = 40 \quad (1)$$

$$(4000)x + (6000)y + (9000)z = 300000$$

$$\Rightarrow 4x + 6y + 9z = 300 \quad (2)$$

$$(1) - (2)$$

$$5x + 3y = 60$$

The possible values of (x, y) (for $x, y > 0$) are $(9, 5)$, $(6, 10)$, and $(3, 15)$.

Among the given choices, twelve can be the difference of the number of employees in department X and department Y. Choice (B)

Q14. DIRECTIONS for questions 14 to 16: Type in your answer in the input box provided below the question.

The following data is available for the monsoon season of a certain racing club. The data is for a total of y days.

- i. There were races on 11 days – morning or evening.
- ii. Whenever there was a race in the morning, there was no race in the evening.
- iii. There were 8 mornings without any race.
- iv. There were 5 evenings without any race.

What is the value of y ?

Enter '0' if you think that the question cannot be answered with the information given.

Total number of instances (morning or evening) in which there was race = 11

Total number of instances (morning or evening) in which there wasn't any race
 $= 8 + 5 = 13$

\therefore Total number mornings and evenings (i.e., instances) with or without race
 $= 11 + 13 = 24$

In y days there will be $2y$ instances of mornings or evenings.

$$\Rightarrow 2y = 24$$

$$\Rightarrow y = 12$$

Ans: (12)

Q15. DIRECTIONS for questions 14 to 16: Type in your answer in the input box provided below the question.

Twelve towns are grouped into four zones, with three towns per zone. The towns are to be connected with telephone lines in the following manner. Every pair of towns belonging to the same

zone is to be connected by two direct lines. Every pair of towns belonging to different zones is to be connected by only one direct line. Find the number of direct telephone lines required.

Each town can be connected to other towns in the same zone using a total of 6 telephone lines. \therefore Total number of telephone lines connecting towns in the same zone = (6) (4) = 24. Let the zones be labelled 1, 2, 3 and 4. Each town in zone 1 can be connected to each town in zone 2, zone 3 and zone 4 using 9 telephone lines. Each town in zone 2 can be similarly connected to each town in other zones (except zone 1) using 6 telephone lines. Each town in zone 3 can be connected to towns in zone 4 using 3 telephone lines. Total number of telephone connections = $24 + 3(9 + 6 + 3) = 78$. Ans: (78)

Q16. DIRECTIONS for questions 14 to 16: Type in your answer in the input box provided below the question.

The average of five positive numbers and two negative numbers is 45. If the average of their absolute values is 51, what is the sum of the two negative numbers?

Let the sum of the five positive numbers be X and let $-x_1$ and $-x_2$ be the two negative numbers.

$$\therefore X - x_1 - x_2 = 7 \times 45 = 315 \quad (1)$$

$$\text{Also, } X + x_1 + x_2 = 7 \times 51 = 357 \quad (2)$$

Now, (2) – (1) gives $x_1 + x_2 = 21$.

Hence, the sum of the two negative numbers is -21 . Ans: (-21)

Q17. DIRECTIONS for question 17: Select the correct alternative from the given choices.

If the standard deviation, the mean and the median of three non-zero numbers are the same, then find the ratio of the absolute values of the minimum and the maximum of these numbers.

a) $5 - 2\sqrt{6} : 1$

b) $5 - 2\sqrt{2} : 1$

c) $3 - 2\sqrt{2} : 1$

d) $1 : 3 - \sqrt{2}$

Since, the mean and the median are the same, the three observations can be taken as $x - d$, x and $x + d$.

The standard deviation of the three observations

$$\sqrt{\frac{(x-d-x)^2 + (x-x)^2 + (x+d-x)^2}{3}}$$

$$= \sqrt{\frac{d^2 + d^2}{3}}$$

$$= \sqrt{\frac{2}{3}} d$$

$$\Rightarrow \sqrt{\frac{2}{3}} d = x$$

$$\therefore \text{The required ratio} = \left| \frac{x-d}{x+d} \right| = \left| \frac{x - \sqrt{\frac{3}{2}} d}{x + \sqrt{\frac{3}{2}} d} \right| = \left| \frac{\sqrt{2} - \sqrt{3}}{\sqrt{2} + \sqrt{3}} \right|$$

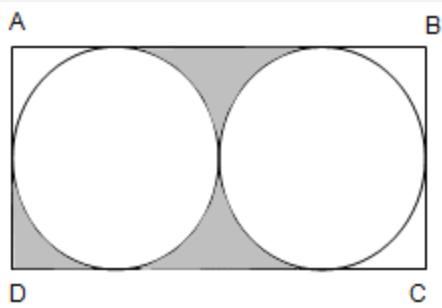
$$= \left| \frac{(\sqrt{3} - \sqrt{2})(\sqrt{3} - \sqrt{2})}{(\sqrt{3} + \sqrt{2})(\sqrt{3} - \sqrt{2})} \right|$$

$$= \left| \frac{(3+2-2\sqrt{2}\sqrt{3})}{1} \right| = 5-2\sqrt{6} : 1$$

Choice (A)

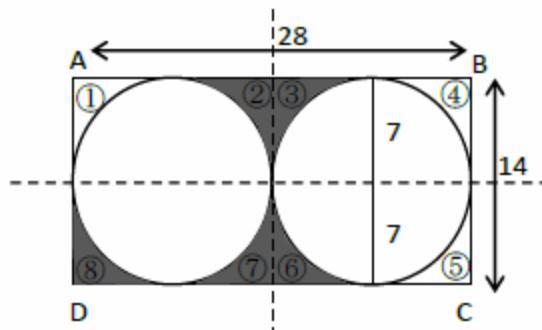
Q18. DIRECTIONS for question 18: Type in your answer in the input box provided below the question.

In the figure, given below, if the diameter of each of the circles is equal to 14 cm, what is the area (in sq.cm) of the shaded region?



Enter your answer as a decimal value, rounded off to two decimal places.

In the figure there are eight regions of equal area, numbered (1) to (8), out of which five regions have been shaded.



From symmetry, (about the dotted lines) we can say that
Area of shaded region

$$\begin{aligned}
 &= \frac{5}{8} [\text{Area of Rectangle} - (2 \times \text{Area of circle})] \\
 &= \frac{5}{8} (28 \times 14 - 2 \times \pi \times 7^2) = \frac{5}{8} \left(28 \times 14 - 2 \times \frac{22}{7} \times 7.7 \right) \\
 &= \frac{5}{8} \cdot 14 (28 - 22) = 52.5 \text{ sq.cm.}
 \end{aligned}$$

Ans: (52.5)

Q19. DIRECTIONS for questions 19 to 25: Select the correct alternative from the given choices.
How many natural numbers divide exactly two of 360, 960, and 1200?

- a) 1
- b) 4

c) 7

d) More than 7

$$360 = 2(4)(9)(5) = 2^3 3^2 5^1 = A \text{ (say)}$$

$$960 = 32(3)(2)(5) = 2^6 3^1 5^1 = B \text{ (say)}$$

$$1200 = 4(3) 2^2 5^2 = 2^4 3^1 5^2 = C \text{ (say)}$$

Numbers which divide both A and B but not C. There are none. Numbers which divide both A and C but not B. There are none. Numbers which divide both B and C but not A:

The index of 2 has to be 4

The index of 3 can be 0 or 1

The index of 5 can be 0 or 1

Thus there are 2(2) or 4 such numbers.

Choice (B)

Q20. DIRECTIONS for questions 19 to 25: Select the correct alternative from the given choices.

If the average of the ages of A and B is 23 years and that of A, B and C is 21 years, the age of C is

a) 15 years.

b) 19 years.

c) 17 years.

d) 27 years.

It is given that, $\frac{A+B}{2} = 23$

$$\Rightarrow A + B = 46 \quad \text{--- (1)}$$

Again, $\frac{A+B+C}{3} = 21$

$$\Rightarrow A+B+C = 63 \quad \text{--- (2)}$$

Subtracting equation (1) from equation (2), we get $C = 17$.

Therefore the age of C is 17 years

Choice (C)

Q21. DIRECTIONS for questions 19 to 25: Select the correct alternative from the given choices.

Two cars, C₁ and C₂, started traveling towards each other, at constant speeds of 45 kmph and 20 kmph respectively, such that C₁ started 30 minutes after C₂. If they met 40 minutes after C₂ started, what was the distance between them when C₂ started to travel?

- a) 33.33 km
- b) 21.87 km
- c) 20.67 km
- d) 20.83 km

In the first 30 minutes, C₂ would have covered 10 km. In the next 10 minutes, both the cars would have covered a distance of $\left(\frac{20+45}{6}\right) = 10.83$ km. The cars travelled for a total distance of 20.83 km to meet, which was the initial distance between the two cars.

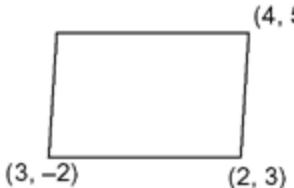
Choice (D)

Q22. DIRECTIONS for questions 19 to 25: Select the correct alternative from the given choices.
If (3, -2), (2, 3) and (4, 5) are three of the vertices of a parallelogram, which of the following cannot be the fourth vertex of the parallelogram?

- a) (5, 0)
- b) (3, 10)
- c) (1, -3)
- d) More than one of the above

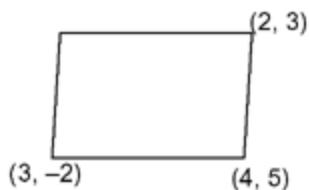
Since, the order in which the points $(3, -2)$, $(2, 3)$ and $(4, 5)$ are to be considered as the vertices of the parallelogram, is not certain, the following cases arise:

(i)



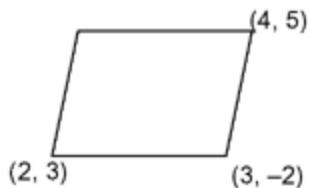
If $(3, -2)$, $(2, 3)$ and $(4, 5)$ are the vertices of the parallelogram taken in that order, then the fourth vertex is $(3 + 4 - 2, -2 + 5 - 3) = (5, 0)$.

(ii)



If $(3, -2)$, $(4, 5)$ and $(2, 3)$ are the vertices of the parallelogram taken in that order, then the fourth vertex is $(3 + 2 - 4, -2 + 3 - 5) = (1, -4)$.

(iii)



If $(2, 3)$, $(3, -2)$, $(4, 5)$ are the vertices of the parallelogram taken in that order, then its fourth vertex is $(2 + 4 - 3, 3 + 5 - (-2)) = (3, 10)$.

∴ The fourth vertex can be $(5, 0)$, $(1, -4)$ or $(3, 10)$. Among the choices given, only choice (C) cannot be the fourth vertex.

Choice (C)

Q23. DIRECTIONS for questions 19 to 25: Select the correct alternative from the given choices.

Find the digit-sum of $0! + 1! + 2! \dots \dots \dots 10!$.

(The digit-sum of a number is defined as the sum of the digits of the number, calculated successively until the result is a single-digit number.

For example, the digit-sum of $645 = 6 + 4 + 5 = 15 \Rightarrow 1 + 5 = 6$. Similarly, the digit-sum of $234 = 2 + 3 + 4 = 9$).

a) 0

- b) 1
c) 3
d) 7

Digit-sum of a number is equal to the remainder obtained when we divide the number by 9, except when the number is a multiple of 9, in which case the digit-sum is 9.

E.g.: $\frac{645}{9}$, Remainder is 6, and $6 + 4 + 5 = 15 = 1 + 5 = 6$.

Now, in $0! + 1! + 2! \dots 10!$ All number after $6!$, are divisible by 9

\therefore we need to find the remainder of $(0! + 1! + 2! + 3! + 4! + 5!)$ when divides by 9.

Sum = $1 + 1 + 2 + 6 + 24 + 120 = 154$ (since $0! = 1$)

Remainder = 1 [$1 + 5 + 4 = 10 = 1 + 0 = 1$]

\therefore The required digit-sum is 1.

Choice (B)

Q24. DIRECTIONS for questions 19 to 25: Select the correct alternative from the given choices.
A retailer made a profit of 25% by selling an article for Rs.120. At what price should he have sold the article, if he wished to make a profit of 50%?

- a) 124
b) 132
c) 144
d) 150

Let the cost price of the article be denoted by x .

$$\text{Now } x + \frac{25}{100}x = 120$$

$$\Rightarrow \frac{5}{4}x = 120$$

$$\Rightarrow x = 96.$$

In order to make a profit of 50%, he should have sold it for

$$x + \frac{50}{100}x = \frac{3}{2}(x) = \frac{3}{2}(96) = 144.$$

Choice (C)

Q25. DIRECTIONS for questions 19 to 25: Select the correct alternative from the given choices.
If the sine of one angle in a triangle is equal to the cosine of another angle in the triangle, then the triangle must be

- a) an equilateral triangle.
- b) an isosceles triangle.
- c) a rightangled triangle.
- d) a rightangled isosceles triangle.

If the sine of one angle is equal to the cosine, the sum of these two angles must be 90°. Hence, the third angle in the triangle must by 90°, and the triangle has to be a right angled triangle. It, however, need not be isosceles.

Choice (C)

Q26. 26.DIRECTIONS for question 26: Type in your answer in the input box provided below the question.

Find the value of a , if $(123)_5$ is divisible by $(a3)_8$.

$$(123)_5 = 1(5^2) + 2(5) + 3 = 38$$

Factors of 38 are 1, 19 and 38.

It is given that, $(a3)_8$ is a factor of 38 as 38 is divisible by $(a3)_8$.

Since $(a3)_8 > 2$ and $(a3)_8$ is odd, it cannot be equal to either 2 or 38.

$$\therefore (a3)_8 = 8a + 3 = 19, \text{ for } a = 2.$$

Ans: (2)

Q27. DIRECTIONS for questions 27 to 29: Select the correct alternative from the given choices.
A certain work is always started at 8:00 a.m. on Mondays and done only between 8:00 a.m. to 12:00 noon and between 1:00 p.m. to 5:00 p.m. on any day. This work, when done by Ram alone, gets completed at 5:00 p.m. on the next day, i.e., Tuesday, and when done by Shyam alone, gets completed in the morning session on the next day, i.e., Tuesday. If today is a Monday, and both Ram and Shyam together start doing the work, at what time could they possibly complete the work?

- a) Today, 1:30 p.m.

- b) Today, 3:00 p.m.
- c) Today, 4:15 p.m.
- d) Tomorrow, 9:15 a.m.

Time taken by Ram to complete the job = 16 hours

Time taken by Shyam to complete the job

= 8 to 12 hours (Since it is mentioned that he completes the work in the morning session it can be at 8:00 a.m. or 12 noon, or any time in between)

Maximum time taken by them to complete the work together

$$= \frac{1}{16} + \frac{1}{12} = \frac{7}{48} \Rightarrow 6 \text{ hours } 51 \text{ minutes}$$

$$\text{Minimum time taken} = \frac{1}{16} + \frac{1}{8} = \frac{3}{16} \Rightarrow 5 \text{ hours } 20 \text{ minutes}$$

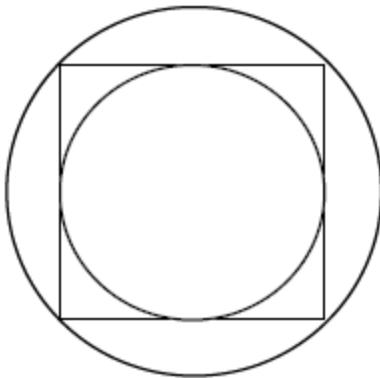
∴ Together, they could complete the work at any time between 2:20 p.m. and 3:51 p.m. on the same day.

Only possible time given is Today, 3:00 p.m.

Choice (B)

Q28. DIRECTIONS for questions 27 to 29: Select the correct alternative from the given choices.
A circle is inscribed in a square, which, in turn, is inscribed in another circle. Find the ratio of the radius of the outer circle to the radius of the inner circle.

- a) $\sqrt{2}:1$
- b) $2:1$
- c) $2\sqrt{2}:1$
- d) $4:1$



Let the radius of the outer circle and the inner circle be R and r respectively

$$\text{Side of the square} = 2r = \frac{2R}{\sqrt{2}}$$

$$\Rightarrow \frac{R}{r} = \frac{\sqrt{2}}{1}$$

Choice (A)

Q29. DIRECTIONS for questions 27 to 29: Select the correct alternative from the given choices.
The angle of elevation of the top of a lighthouse from a moving ship changed from 30° to 60° when the ship moved $100 \sqrt{3}$ m towards the lighthouse. Find the height of the lighthouse.

a) 90 m

b) 150 m

c) 120 m

d) 180 m

Let the height of the light house, A B be ℓ m.

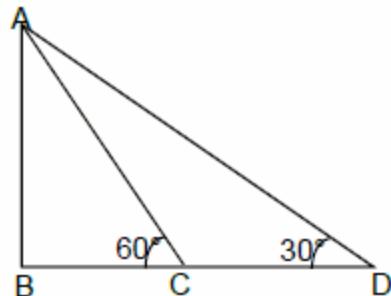
In the above figure, $BD = \frac{AB}{\tan 30^\circ} = \ell\sqrt{3}$ and

$$BC = \frac{AB}{\tan 60^\circ} = \frac{\ell}{\sqrt{3}}$$

It is given that, the ship approached $100\sqrt{3}$ towards the light house, i.e. it covered C D or $\left(1\sqrt{3} - \frac{\ell}{\sqrt{3}}\right)$ m

$$\text{Now } \ell\sqrt{3} - \frac{\ell}{\sqrt{3}} = 100\sqrt{3} \Rightarrow \frac{2\ell}{\sqrt{3}} = 100\sqrt{3}$$

$$\therefore \ell = 150 \text{ m}$$



Choice (B)

Q30. DIRECTIONS for questions 30 and 31: Type in your answer in the input box provided below the question.

How many pairs of numbers exist such that their LCM is 1260 and their HCF is a prime number?

$$\text{LCM} = 1260 = 2^2 \times 3^2 \times 5 \times 7$$

For HCF to be a prime number, the ordered pairs should be of the form.

$(2k_1, 2^2k_2), (3k_1, 3^2k_2), (5k_1, 5k_2), (7k_1, 7k_2)$, where k_1 & k_2 are coprimes.

The number of ordered pair of the form $(2k_1, 2^2k_2) = 2^3 = 8$

(since 3², 5, 7 are three terms, which can be the terms of either k_1 or k_2 but not both).

Similarly, we get 8 cases, 4 cases and 4 cases each with $(3k_1, 3^2k_2), (5k_1, 5k_2)$ and $(7k_1, 7k_2)$ respectively.

$$\text{Total number of pairs} = 8 + 8 + 4 + 4 = 24 \text{ pairs.}$$

Ans: (24)

Q31. DIRECTIONS for questions 30 and 31: Type in your answer in the input box provided below the question.

If $a \phi b = ab - a^b$, then find the value of $3 \phi (2 \phi 1)$

$$3 \phi (2 \phi 1) = 3 \phi (2 - 2^1) = 3 \phi 0 = 3 \times 0 - 3^0 = -1.$$

Ans: (-1)

Q32. DIRECTIONS for questions 32 and 33: Select the correct alternative from the given choices.

A boat travels upstream, from point X to point Y, and then returns from point Y to point Z, mid-way between X and Y, and takes 14 hours for the entire trip. If the boat would take 6 hours to travel from X to Y in still water, find the time that the boat took to travel from Y to Z.

a) 2 hours

b) 3 hours

c) 4 hours

d) 1 hour

Let the speed of the boat in still water and the speed of the water current be u and v respectively.

$$\text{Given, } \frac{d}{u-v} + \frac{(d/2)}{u+v} = 14 \text{ and } \frac{d}{u} = 6$$

$$\text{Substituting } d=6u \text{ in } \frac{d}{u-v} + \frac{(d/2)}{u+v} = 14,$$

$$\text{we get } \frac{6u}{u-v} + \frac{6u}{2(u+v)} = 14$$

$$\Rightarrow 6u(u+v) + 3u(u-v) = 14(u^2 - v^2)$$

$$\Rightarrow 6u^2 + 6uv + 3u^2 - 3uv = 14u^2 - 14v^2$$

$$\Rightarrow 5u^2 - 3uv - 14v^2 = 0$$

$$\Rightarrow u = \left(\frac{3 \pm \sqrt{3^2 - (4)(5)(-14)}}{2(5)} \right) v$$

Since, u and v are should have the same sign, we get $u = 2v$.

$$\therefore \text{The required time} = \frac{\left(\frac{d}{2}\right)}{u+v} = \frac{3u}{u+\frac{u}{2}} = 2 \text{ hours.}$$

Choice (A)

Q33. DIRECTIONS for questions 32 and 33: Select the correct alternative from the given choices.
If a, b, c, d and e are positive integers, such that $a : b : c = 2 : 3 : 4$ and $b : d : e = 2 : 3 : 5$, find the minimum possible sum of $d + e$.

a) 8

b) 16

c) 24

d) 48

As $a : b : c = 2 : 3 : 4$, let us consider a, b and c as $x, 3x$ and $4x$ respectively.

Similarly as $b : d : e = 2 : 3 : 5$,

Let us consider b, d and e as $2y, 3y$ and $5y$ respectively.

$$\therefore b = 3x = 2y = 6k \text{ (say)}$$

$$\Rightarrow y = 3k$$

$$\therefore d = 9k \text{ and } e = 15k.$$

Thus the sum of d and e is $24k$.

The minimum possible sum of d and e is 24 (for $k = 1$)

Choice (C)

Q34. DIRECTIONS *for question 34:* Type in your answer in the input box provided below the question.

If A and B are two sets such that $n(A \cap B) = 0$, and the difference between the number of proper subsets of A and the number of proper subsets of B is 496, then find the number of proper subsets of $A \cup B$.

The number of proper subsets of a set comprising n elements is $2^n - 1$

Let us consider that the two sets A and B have ' a ' elements and ' b ' elements respectively.

It is given that,

$$(2^a - 1) - (2^b - 1) = 496$$

$$2^a - 2^b = 496 = 2^4(31) = 2^4(32 - 1)$$

$$\therefore 2^a - 2^b = 2^9 - 2^4 = 496$$

$$\therefore a = 9 \text{ and } b = 4.$$

$$\text{Now } n(A \cup B) = 9 + 4 = 13 \text{ (since } n(A \cap B) = 0\text{)}$$

$$\therefore \text{Number of proper subsets of } A \cup B = 2^{13} - 1 = 8191.$$

Ans: (8191)