T.I.M.E.
Triumphant Institute of Management Education Pvt. Ltd

Ref: AIMCAT2016

INSTRUCTIONS

1. Read the instructions given at the beginning/end of each section or at the beginning of a group of questions very carefully.

2. This test has a total of 100 questions in three sections: (i) Verbal Ability and Reading Comprehension –34 Questions (ii) Data Interpretation and Logical Reasoning –32 Questions and (iii) Quantitative Ability –34 Questions. The total time available for the test is **180 minutes**. However, you will be allotted exactly 60 minutes for answering the questions in each section and you cannot switch from one section to another while answering the questions in a section.

3. All questions carry three marks each. Each wrong answer to any multiple-choice type question will attract a penalty of one mark. Wrong answers to any non multiple-choice type question will not attract any penalty.

SECTION – I
Number of Questions = 34

DIRECTIONS *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.

1. 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.

2. 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.

3. 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.

4. 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

5. 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.

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.

6. 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.

7. 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.

8. 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.

9. 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.

10. 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.

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 drops, 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 CO_2, 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.

11. 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.

12. 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

13. 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.

14. 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.

15. 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

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 for ever, 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.

16. 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.
(D) is an example of the consequences of government propaganda and manipulation.

17. 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.

18. 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.

19. 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.

20. The author is least likely to agree with of 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.

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.

21. (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

22. (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

23. (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

24. (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

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.

25. 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.

26. 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.

27. 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.

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

28. 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.

29. 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

30. 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.

31. 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.

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].

32. 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 Kindom.
(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.

33. 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.

34. 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.

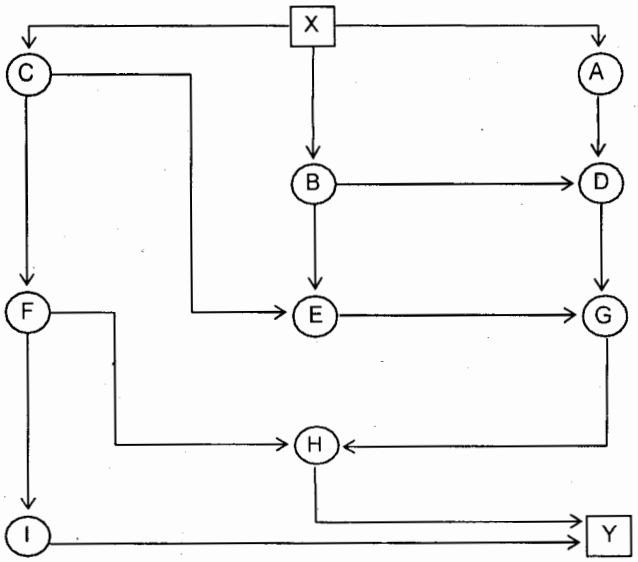
SECTION – II
Number of Questions = 32

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.



DIRECTIONS *for question 1:* Select the correct alternative from the given choices.

1. The number of days required to complete the task by incurring the least total cost is
(A) 75 (B) 80 (C) 82 (D) 87

DIRECTIONS *for question 2:* Type in your answer in the input box provided below the question.

2. If the task has to be completed in less than 80 days, then what will be the minimum possible total cost (in ₹) incurred?

₹ ☐

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

3. If the total cost incurred cannot exceed ₹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

4. 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

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

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

5. 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

DIRECTIONS *for question 6:* Type in your answer in the input box provided below the question.

6. What will be the output if Ravi inputs '314 + 470' in the calculator?

☐

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

7. 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

8. 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

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 about 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.

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

Rahul – 7206310424 Ramesh – 1112102565
Karthik – 8202290214 Dhruv – 5604240178

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

9. Who is the heaviest among the four?
(A) Rahul (B) Ramesh
(C) Karthik (D) Dhruv

10. Who is the oldest among the four?
(A) Rahul (B) Ramesh
(C) Karthik (D) Dhruv

11. Who among the following share the same birthday?
(A) Rahul and Ramesh
(B) Ramesh and Dhruv
(C) Rahul and Dhruv
(D) Rahul and Karthik

12. The social security number of Rakesh, a common friend of the four, is 8412201224. If the social security number of Rakesh also followed the pattern specified above, who among the five friends has the maximum number of children?
(A) Ramesh (B) Rakesh
(C) Rahul (D) Cannot be determined

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.

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

13. What is the PIN of B?

14. How many of the four PINs are multiples of 3?

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

16. 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)*

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.

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

17. Which country is Tarun from?
(A) Germany (B) England
(C) France (D) Cannot be determined

18. Which brand is endorsed by the person who plays Tennis?
(A) New Balance
(B) Under Armour
(C) Gatorade
(D) Nike

19. What is the colour of the shirt that the person from England wears?
(A) White (B) Blue
(C) Green (D) Yellow

20. The person who plays Hockey is from
(A) England. (B) Belgium.
(C) France. (D) Germany.

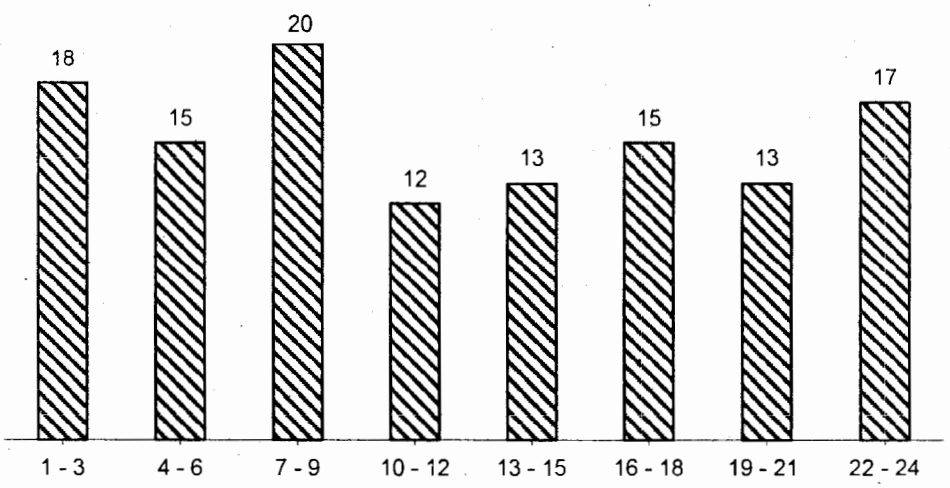
DIRECTIONS *for questions 21 to 24:* Answer the questions on the basis of the information given below.

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.

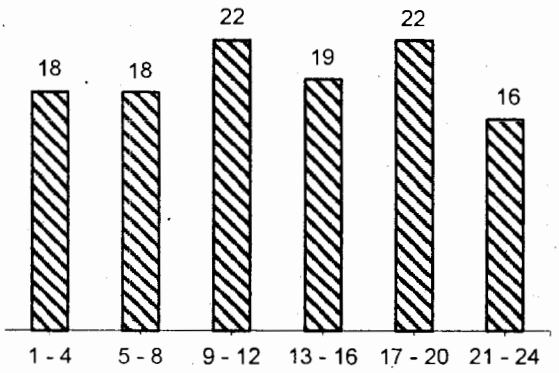
It is known that, in the entire group, there are at least four persons from each gender who went to the movies any given number of times in the month. That is, for any given n, there are at least four females and at least four males who went to the movies n times in the month. Further, it is known that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

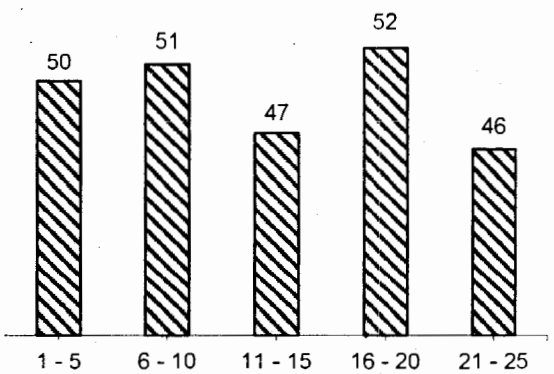
Agency 1 - Distribution of Males



Agency 2 - Distribution of Females



Agency 3 - Distribution of Total Group



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

21. 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

22. How many females went to the movies exactly 16 times during the month?
(A) 5
(B) 6
(C) 7
(D) Cannot be determined

23. 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

24. 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(Male, 22) & N(Female, 16)
(B) N(Male, 21) & N(Female, 21)
(C) N(Male, 14) & N(Female, 16)
(D) N(Male, 20) & N(Female, 14)

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 5th	31	32.0
March 6th	20	31.0
March 8th	44	31.4
March 10th	30	29.6
March 13th	18	22.0
March 15th	36	18.8
March 18th	42	36.2
March 20th	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.

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

25. How many people visited the restaurant on March 9th?

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

26. 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

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

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

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

28. 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.

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.

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

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

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

30. Who among the following is definitely part of three teams?
(A) D (B) F (C) G (D) J

31. 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

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

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

SECTION – III
Number of Questions = 34

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

1. 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

2. 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).

3. 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

4. A function $g(x, y)$ is defined as the two-digit number of the form $(10x + y)$. Another function $f(x, y, n) = x^n + y^{n+1}$ 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

5. Rahul invested ₹10,000 at 10% p.a., simple interest, for three years and another ₹10,000 at 8% p.a., interest compounded annually, for two years. How much will Rahul's investments be worth after two years?
(A) ₹24,552
(B) ₹23,552
(C) ₹23,664
(D) ₹24,664

6. 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

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

7. 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?

8. 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

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

9. 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

10. If $x = \sqrt{\dfrac{6}{4+\dfrac{6}{2+\sqrt{\dfrac{6}{4+\dfrac{6}{2+\ldots\ldots\infty}}}}}}$, find the value of x.

(A) 2 (B) $\frac{9-\sqrt{33}}{2}$

(C) 1 (D) $\frac{9-\sqrt{33}}{4}$

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

11. What is the remainder when 40^{135} is divided by 11?

12. 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.

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

13. 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 ₹4,000, ₹6,000 and ₹9,000 respectively. If the total salary paid to the employees of these three groups is ₹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

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

14. 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.

15. 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.

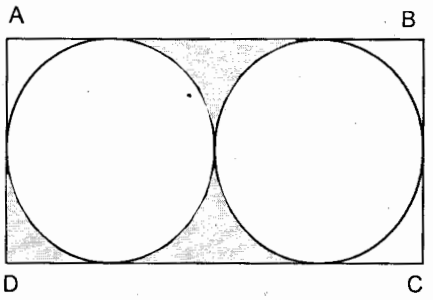
16. The average of five positive numbers and two negative numbers is 45. If the average of their absolute values is 51, what is the sum of the two negative numbers?

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

17. 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) $1:3-\sqrt{2}$

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

18. 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.

sq.cm.

DIRECTIONS *for questions 19 to 25:* Select the correct alternative from the given choices.

19. How many natural numbers divide exactly two of 360, 960, and 1200?
(A) 1
(B) 4
(C) 7
(D) More than 7

20. 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.

21. Two cars, C_1 and C_2, started traveling towards each other, at constant speeds of 45 kmph and 20 kmph respectively, such that C_1 started 30 minutes after C_2. If they met 40 minutes after C_2 started, what was the distance between them when C_2 started to travel?

(A) 33.33 km (B) 21.87 km
(C) 20.67 km (D) 20.83 km

22. 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

23. Find the digit-sum of 0! + 1! + 2! . . . . . .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

24. A retailer made a profit of 25% by selling an article for ₹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

25. 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.

DIRECTIONS *for question 26:* Type in your answer in the input box provided below the question.

26. Find the value of a, if $(123)_5$ is divisible by $(a3)_8$.

DIRECTIONS *for questions 27 to 29:* Select the correct alternative from the given choices.

27. 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.

28. 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

29. 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

DIRECTIONS *for questions 30 and 31:* Type in your answer in the input box provided below the question.

30. How many pairs of numbers exist such that their LCM is 1260 and their HCF is a prime number?

31. If $a \phi b = ab - a^b$, then find the value of $3 \phi (2 \phi 1)$

DIRECTIONS *for questions 32 and 33:* Select the correct alternative from the given choices.

32. 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

33. 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

DIRECTIONS *for question 34:* Type in your answer in the input box provided below the question.

34. 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 $A \cup B$.