CAT Sample Paper 2
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Verbal Ability

DIRECTIONS *for questions 1 to 3:* **Read the following passage and answer the questions that follow it.**

Physicists have become increasingly argumentative about what exactly time is. Because this is now being recognized as perhaps the most fundamental question of all. For decades they have been attempting to wed quantum mechanics, our theory of how very small things behave, to relativity, our theory of how space, time and matter interact. This would give us the long-sought-after theory of quantum gravity that describes the entire universe.

Constructing this theory has been an uphill struggle, though, because it is unclear how time fits within it. "There are very different notions of time in general relativity and quantum theory," Smolin says. "It's pretty clear that the nature of time is the key issue".

Last month, Smolin and other theorists, along with mathematicians and philosophers, got together at the Perimeter Institute to thrash out time's problems. So complex is the issue that everyone involved seems to have a different idea. It turns out that if you want to understand time, you might need to grab some measurements from the future, watch a big bang explode at the edge of the universe, or delve into the anomalies presented by the most unruly of the subatomic particles. For some, the only is to scrap the notion of time altogether.

Scientists have long worried about the nature of time. At the beginning of the 18th century, Isaac Newton and Gottfried Leibniz argued over whether time was truly fundamental to the universe. Then Einstein came along and created more problems: his general theory of relativity is responsible for our most counter-intuitive notions of time.

General relativity knits together space, time and gravity. Confounding all common sense, how time passes in Einstein's universe depends on what you are doing and where you are. Clocks run faster when the pull of gravity is weaker, so if you live up a skyscraper you age ever so slightly faster than you would if you lived on the ground floor where Earth's gravitational tug is stronger.

"General relativity completely changed our understanding of time," says Carlo Rovelli, a theoretical physicist at the University of the Mediterranean in Marseille, France.

At the other extreme there is the quantum world, where time seems to be almost irrelevant. "Quantum theory doesn't really allow for measurements of time, "Says Aephraim Steinberg of the University of Toronto in Canada. "Asking how long a particle stays in a certain region of space turns out to be something that, in quantum theory, may have hundreds - or an infinite number of different answers."

This contradiction in general relativity's and quantum theory's description of time is the fundamental sticking point for a single theory that describes the entire universe. How to reconcile the two descriptions of time continues to stump the world's best minds. There is no shortage of ideas, though, with some believing we could make better progress towards a quantum theory of gravity if we think the unthinkable and abolish time altogether. "The of the present difficulties about time is just to forget about it," says Rovelli.

1.   Why does science not have a single theory to explain the universe?

(1) Scientists are unable to arrive at a consensus on the notion of quantum gravity.
(2) Einstein came up with the most baffling theory to confuse matters.
(3) Time is inconsequential when we talk about quantum mechanics.
(4) Time remains an inexplicable concept in the domain of science.
(5) Quantum mechanics challenges the concept of time.

2. Which of the following statements is not supported by the passage?

(1) Quantum theory of gravity abolishes time
(2) Einstein propounded the general theory of relativity
(3) Quantum theory of gravity would link general theory of gravity with quantum mechanics
(4) General theory of relativity combines time, space and gravity
(5) Quantum mechanics deals with subatomic particles

3. What can be an appropriate title for, the passage?

(1) Time to understand the universe
(2) Grappling with time

(3) Time and a universal theory of universe
(4) Discounting time
(5) Understanding the universe

DIRECTIONS *for questions 4 to 7:* **Read the following passage and answer the questions that follow it.**

Last evening, on the longest day of the year, I took a walk in a meadow near my home. At the edge of the meadow a path opened in to the woods, and I followed it perhaps a hundred yards to the bank of a small stream where I rested on a rock and watched the brook flow. Then I walked back.

Nothing spectacular happened. No large animal jumped out to demonstrate its majesty. The flora was beautiful but unremarkable: buttercups, Queen Anne's lace, daisies, lupins. The sky didn't crackle with summer lightning; the sunset was only streaks of purples, some rosy glow on the underbellies of the clouds. A few mosquitoes made their presence known. It was simply a lovely night.

And simply the sort of scene that we have evolved with for hundreds of thousands of years, that has made us who we are, that we can't be fully human, or at least fully sane, without. The sort of scene whose absence in our lives is now making us slowly crazy. If there is a pertinent modern question, it is "How much is enough?" The consumer societies we have created posit that the only possible answer is "More". And so in pursuit of more we have turned ourselves into tubby folk, raised the temperature of the planet one degree with a further five degrees in prospect, countenanced the ever deeper gulfs between rich and poor, and so on. And in the process made ourselves …… happy?

But say you're in a meadow, surrounded by wild flowers. Do you find yourself thinking, "They could do with some more wild flowers over there"? Do you glance up at the mountains on the horizon and think, "Some more mountains would be nice"? Do you lie on the rock by the brook thinking, "This brook needs more rocks"? Does the robin in that tree chide herself for not tripling the size of her nest? I think not. Nature schools us in sufficiency - its aesthetics and its economy demonstrate 'enoughness' at every turn. Time moves circularly through the natural world - next spring there will be wild flowers again. Not more wild flowers: second quarter output for 2010 will show no year-on-year gain. Growth only replaces, since the planet is already accomplishing all the photosynthesis that's possible. It offers the great lesson of being simultaneously abundant and finite.

Interdependent, too. The emergent science of ecology is easily summed up: everything's connected. Field biologists using sensitive detectors have discovered that the needles of trees near Alaskan rivers owe their nitrogen to the carcasses of salmon that die along the banks, the same salmon that feed the bears whose pawing aerates the soil that ......

We know now that this is true, but interconnection is anathema to a consumer notion of the world, where each of us is useful precisely to the degree that we consider ourselves the centre of everything. We believe that pleasure comes from being big, outsized, immortal; now our zealots imagine genetically engineering us for greater greatness. But the testimony of the rest of creation is that there's something to be said for fitting in.

And because of that, the natural world offers us a way to think about dying, the chief craziness for the only species that can anticipate its own demise. If one is a small part of something large, if that something goes on forever, and if it is full of beauty and meaning, then dying seems less shocking. Which undermines about half the reason for being a dutiful consumer, for holding ageing forever at bay. Six months from now, on the shortest night of the year, this field will be under two feet of snow. Most of what I can see will be dead or dormant. And six months after that it will be here again as it is tonight.

Advertising, hyper consumerism, ultra-individualism - these are designed to make you crazy. Nature, like close-knit human community, is designed to help you stay sane. You needn't be in the wilderness to feel in balm: a park, a container garden on the patio, a pet dog, a night sky, a rainstorm will do. For free.

4.   In this passage, the author primarily

(1) reminisces of the times when Nature guided our way of life.

(2) criticises man for exploiting Nature and ruining the environment.

(3) underlines the need for man to adopt Nature's way of life.

(4) warns mankind that hyper consumerism and ultra-individualism will wreck peace on earth.

(5) advises man to slow down his pace of activity and follow Nature's path.

5.   What does the author want to convey when he says "second quarter output for 2010 will show no year-on-year gain"?

(1) There is a limit to what Nature can do.

(2) Man can't match Nature in any activity.
(3) Comparisons have no place in the world of Nature.
(4) Growth in Nature is relative and not a certainty.
(5) Nature's bounty is immeasurable.

6. According to the passage, nature teaches us to be

(1) self-sufficient.
(2) contented.
(3) empathetic.
(4) generous.
(5) useful.

7. Which of the following options is a possible conclusion to the unfinished sentence in the fifth para?

(1) …. fixes the nitrogen content.
(2) …. supplies the required nitrogen to the vegetation in the Alaskan region.
(3) …. nurtures the needles of trees.
(4) …. enriches the flora and fauna in the Alaskan plains.
(5) …. controls the levels of nitrogen used by trees in the Alaskan region.

DIRECTIONS *for questions 8 to 11:* **Read the following passage and answer the questions that follow it.**

You're not likely to hear about this from your doctor, but fake medical treatment can work amazingly well. For a range of ailments, from pain and nausea to depression and Parkinson's disease, placebos - whether sugar pills, saline injections, or sham surgery-- have often produced results that rival those of standard therapies.

In a health care industry fuelled by ever newer and more dazzling cures, this phenomenon is usually seen as background noise, or even as something of an annoyance. For drug companies, the placebo effect can pose an obstacle to profits -- if their medications fail to outperform placebos in clinical trials, they won't get approved by the FDA. Patients who benefit from placebos might understandably wonder if the healing isn't somehow false, too.

But as evidence of the effect's power mounts, members of the medical community are increasingly asking an intriguing question: if the placebo effect can help patients, shouldn't we start putting it

to work? In certain ways, placebos are ideal drugs: they typically have no side effects and are essentially free. And in recent years, research has confirmed that they can bring about genuine improvements in a number of conditions. An active conversation is now under way in leading medical journals, as bioethicists and researchers explore how to give people the real benefits of pretend treatment.

In February, an important paper was published in the British medical journal the Lancet, reviewing the discoveries about the placebo effect and cautiously probing its potential for use by doctors. In December, the Michael J. Fox Foundation announced plans for two projects to study the promise of placebo in treating Parkinson's. Even the federal government has taken an interest, funding relevant research in recent years.

But any attempt to harness the placebo effect immediately runs into thorny ethical and practical dilemmas. To present a dummy pill as real medicine would be, by most standards, to lie. To prescribe one openly, however, would risk undermining the effect. And even if these issues were resolved, the whole idea still might sound a little shady--offering bogus pills or procedures could seem, from the patient's perspective, hard to distinguish from skimping on care.

"In the last 10 years we've made tremendous strides in demonstrating the biological veracity of the placebo effect," says Ted Kaptchuk, an associate professor at Harvard Medical School and one of the coauthors of the Lancet article. "The frontier is, how do we utilize what is clearly an important phenomenon in a way that's consistent with patient-practitioner trust, and informed consent?"

There are limits to even the strongest placebo effect. No simulation could set a broken arm, of course, or clear a blocked artery. As a rule, placebos appear to affect symptoms rather than underlying diseases--although sometimes, as in the case of depression or irritable bowel syndrome, there's no meaningful distinction between the two. Moreover, placebos have often received undue credit for recovery that might have occurred anyway. Indeed, the effect is famously difficult to identify, measure, and even coherently define. There is debate about the magnitude of the response, with some calling it modest at best, and opposing the idea of using placebos clinically.

But according to advocates, there's enough data for doctors to start thinking of the placebo effect not as the opposite of medicine, but as a tool they can use in an evidence-based, conscientious manner. Broadly speaking, it seems sensible to make every effort to enlist the body's own ability to heal itself--which is what, at bottom,

placebos seem to do. And as researchers examine it more closely, the placebo is having another effect as well: it is revealing a great deal about the subtle and unexpected influences that medical care, as opposed to the medicine itself, has on patients.

Phony treatment is hardly a novel concept in medicine. The word "placebo"--Latin for "I shall please"--has been used in a medical context since at least the late 1700s, referring to inert treatments given to placate patients. Arguably, until the scientific breakthroughs of the 20th century, medical history was little more than one long series of placebos.

But in the postwar era, the profession changed in a way that relegated placebos to the shadows. New medicines began to emerge that actually cured diseases. At the same time, the longstanding paternalism of doctors was yielding to a new ethos that respected the patient's right to understand and consent to treatment. Gradually, fake pills began to seem less like a benign last resort, and more like a breach of trust. To be sure, some doctors continued to use placebos--typically, "impure" placebos such as vitamins that had no specific effect on the malady in question. But they did so quietly, knowing the practice was frowned upon.

As sugar pills were losing their place in the physician's arsenal, they assumed a different role: as a neutral placeholder in drug testing. This development is usually traced back to a 1955 paper by Henry Beecher, a Harvard anaesthesiologist who argued that the placebo effect was so potent that researchers needed to account for it when testing new drugs. Today, the "gold standard" of medical testing is the randomised clinical trial, in which the new drug must beat a placebo to prove its worth.

Some researchers argue that the real source of a placebo's effect is the medical care that goes along with it--that the practice of medicine exerts tangible healing influences. This notion has received support from experiments known as "open-hidden" studies in which patients receive painkiller either unknowingly (they are connected to a machine that delivers it covertly) or in an open fashion (the doctor is present, and announces that relief is imminent). Patients in the "open" group need significantly less of the drug to attain the same outcome. In other words, a big part of the effect comes from the interactions and expectation surrounding the drug.

It may be, then, that the simplest and least ethically hazardous way to capitalize on the placebo effect is to acknowledge that medicine isn't just a set of approved treatments--it's also a ritual, with symbolism and meaning that are key to its efficacy. At its best, that ritual spurs positive expectations, sparks associations with past

healing experiences, and eases distress in ways that can alleviate suffering. These meanings, researchers say, are what the placebo effect is really about.

If this is true, then the takeaway is not necessarily that we should be dispensing more fake pills--it's that we should think less about any pill and more about the context in which it's given. Whether we call it the placebo effect or use new terms, the research in this field could start to put a measurable healing value on doctors' time and even demeanour, rather than just on procedures and pills. And that could change medicine in a way that few blockbuster drugs ever could.

8. When the author says '…… until ….. the 20ᵗʰ century, medical history was little more than one long series of placebos' he means that

(1) placebos have been used as part of the treatment for long.

(2) placebos were used regularly until the 20ᵗʰ century.

(3) placebos were the accepted form of treatment prior to the 20ᵗʰ century.

(4) people did not expect dramatic improvement in their conditions until the 20ᵗʰ century.

(5) medicines that actually cured diseases were discovered only after the 20ᵗʰ century.

9. The health care industry sees the placebo as 'a background noise' because

(1) the industry does not believe that placebos have any real healing power.

(2) the placebo is not only a threat to its profit but also to its medicines as they have to out-perform the placebo.

(3) the placebo is a mere irritant from time to time and not a real threat to it.

(4) the placebo leads the patients to doubt the efficacy of the pills per se.

(5) doctors are in favour of giving the placebo a chance before administering a real drug.

10. The relationship of the first para to the last can best be described as:

(1) The first para makes an observation and the last the best use to which it can be put.

(2) The first para raises a question and the last para gives an answer to

that question.

(3) The first para poses a dilemma and the last para on how it can be sorted out.

(4) The first para recommends a procedure and the last justifies the need for it.

(5) The first para introduces a revolutionary new concept and the last para the benefits to be derived from it.

11.   That the placebo has come into its own in recent times is borne out by

(1) its lack of side effects.

(2) its being essentially free.

(3) federal funding being made available for research on placebo.

(4) the real improvement that it produces.

(5) the article in the medical journal Lancet.

DIRECTIONS *for questions 12 to 14:* Each statement has a part missing. Choose the best option, from those given below the statement, to make up the missing part.

12.   Our misapprehension _____ has been afflicted.

(1) about the nature of language has occasioned a greater waste of time, effort and genius, than the other mistakes and delusions with which humanity

(2) of the nature of language has occasioned a greater waste of time, effort, and genius than all the other mistakes and delusions with which humanity

(3) with the nature of language occasioned a greater waste of time, effort and genius, than all the other mistakes and delusions with which humanity

(4) of the nature of language had occasioned a greater waste of time and genius, than all the other mistakes and delusions through which humanity

(5) with the nature of language has occasioned a greater waste of time, and effort, and genius, than the other mistakes and delusions with which humanity

13.   The sheer grandeur of the colosseum - the iconic face of Rome today - even in a ruined state _____, the favourite blood sport of the Roman nobility.

(1) might have taken one's breath away would it not be for the knowledge that this was the venue to many a gruesome gladiatorial fights

(2) might take one's breath away had it not been for the knowledge that this was the venue of many a gruesome gladiatorial fights

(3) might have taken one's breath away had it not been for the knowledge that this was the venue of many a gruesome gladiatorial fight

(4) might take one's breath away has it not been for the knowledge that this was the venue of many a gruesome gladiatorial fight

(5) might have taken one's breath away would it not be for the knowledge that this was the venue to many a gruesome gladiatorial fight

14. Evolutionary game theory is _____ about why human cognitive and emotional traits developed as they did.

(1) is not just useful in providing an explanation for how social instincts may have developed in primates and man but also in telling something

(2) is useful not just in providing an explanation of how social instincts may have developed in primates and man but also in telling something

(3) is useful not in just providing an explanation for how social instincts may have developed in primates and man but also in telling us something

(4) is useful not just in providing an explanation for how social instincts may have developed in primates and man but also in telling us something

(5) is useful not just in providing an explanation on how social instincts may have developed in primates and man but also in telling something

DIRECTIONS *for questions 15 to 17:* **Each question presents a paragraph followed by 5 statements marked A to E. Read all and identify the individual statements as:**
  L - if the statement can be logically concluded from the paragraph.
C - if the statement presents a thought or idea contrary to that presented in the paragraph.
F - if the statement is a far-fetched conclusion or inference from the paragraph.
I - if the statement is irrelevant to the context of the para or is not L, C or F.

Select the answer option that best describes the set of 5 statements.

15. Decision makers tend to have distinctive styles. One such style is for the decision maker to seek the widest possible input from advisers and to explore alternatives while making up his or her mind. In fact, decision makers of this sort will often argue vigorously for a particular idea, emphasizing its strong points and downplaying its weaknesses, not because they actually believe in the idea but because they want to see if their real reservations about

it are idiosyncratic or are held independently by their advisers.

(A) If certain decision makers' statements are quoted accurately and at length, the content of the quote could nonetheless be greatly at variance with the decision eventually made.

(B) Certain decision makers do not know which ideas they should believe in until after they have presented a variety of ideas to their advisers.

(C) If certain decision makers dismiss an idea out of hand, it must be because its weaknesses are more pronounced than any strong points it may have.

(D) Certain decision makers proceed in a way that makes it likely that they will frequently decide in favour of those ideas that they convince their advisors of.

(E) If certain decision makers' advisers know the actual beliefs of those they advise, those advisers will give better advice than they would if they did not know those beliefs.

(1) FFICI
(2) FIICI
(3) LFCCI
(4) LFICI
(5) FFCCI

16.   Some flowering plant species, entirely dependent on bees for pollination, lure their pollinators with abundant nectar and pollen, which are the only source of food for bees. Often the pollinating species is so highly adapted that it can feed from-and thus pollinate-only a single species of plant. Similarly, some plant species have evolved flowers that only a single species of bee can pollinate-an arrangement that places the plant species at great risk of extinction. If careless applications of pesticides destroy the pollinating bee species, the plant species itself can no longer reproduce.

(A) The total extinction of some plants would force certain bees to mutate so as to adapt to plants that remain.

(B) If the sole pollinator of a certain plant species is in no danger of extinction, the plant species it pollinates is also unlikely to become extinct.

(C) Some bees are able to gather pollen and nectar from any species of plant.

(D) The blossoms of most species of flowering plants attract some species of bees and do not attract others.

(E) The total destruction of the habitat of some plant species could cause some bee species to become extinct.

(1) FLCFL
(2) CLIIL
(3) FLCIL

(4) CLCFL
(5) ILCFL

17.   If the regulation of computer networks is to be modelled on past legislation, then its model must be either legislation regulating a telephone system or else legislation regulating a public broadcasting service. If the telephone model is used, computer networks will be held responsible only for ensuring that messages get transmitted. If the public broadcast model is used, computer networks will additionally be responsible for the content of those messages. Yet a computer network serves both these sorts of functions: it can serve as a private message service or as a publicly accessible information service. Thus neither of these models can, through replication, be appropriate for computer networks.
(A) Regulation of computer networks is required in order to ensure the privacy of the messages transmitted through such networks.
(B) The regulation of computer networks should not be modelled on any past legislation.
(C) Computer networks were developed by being modelled on both telephone systems and television networks.
(D) Legislators who do not have extensive experience with computers should not attempt to write legislation regulating computer networks.
(E) Legislation to regulate computer networks merely needs to duplicate those that regulate telephone systems and public broadcasting systems, read together.

(1) LFIFF
(2) LLIFF
(3) LFIFC
(4) FLCLF
(5) IFIFC

DIRECTIONS *for questions 18 to 20:* The sentences given in each of the following questions, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a letter. From among the five choices given below each question, choose the most logical order of sentences that constructs a coherent paragraph.

18.   (A) We think back with an element of nostalgia to that earlier dream of a world in which we were promised accurate prediction, control and endless progress.
(B) Add to this a host of other problems we encounter and things do seem to be in a mess.
(C) We feel today that we are living in a world that is constantly in

crisis.

(D) In the face of all this we feel a burning need for corrective action, for major interventions, government legislation, aid programmes.

(E) All around us newspapers and television warn of global warming and environmental degradation, of terrorism and international conflicts, of Third World poverty and the implications of the recent economic slump.

(1) CEDBA

(2) CEBDA

(3) CEDAD

(4) CEBAD

(5) CAEBD

19.   (A) In Canada, however, victims' rights groups and community campaigns mounted sustained pressure on the government.

(B) The report slammed Canada's security services for a series of staggering failures they committed in the months leading up to the bombing, and for the botched investigation that followed it.

(C) Twenty-five years ago, Air India flight 182 from Montreal to New Delhi exploded over the Irish sea, killing all 329 on board.

(D) Earlier this month, their relentless work fielded results when a commission of inquiry led by a retired Canadian Supreme Court Judge, John Major, published its findings.

(E) Even though most of the victims were Indian nationals or of Indian origin, the tragedy disappeared from the fore-ground of public consciousness with a strange speed-displaced perhaps by the succession of horrors that have scarred the country since then.

(1) CEABD

(2) CEBAD

(3) CADBE

(4) CEADB

(5) CAEDB

20.   (A) Opinions differ but I am convinced this is a good thing.

(B) Your government may not prosecute you for the crimes you have committed but if your offences are serious enough, the chances are that some court in some other country might.

(C) Every country that values the rule of law must ensure that no individual, regardless of official affiliation, enjoys impunity.

(D) Even if legal concepts like universal jurisdiction remain controversial, the globalisation of economic and family life means individuals who violate human rights can no longer count on being shielded forever by the walls of national sovereignty.

(E) As Israeli officers and politicians are today discovering, and as the late Chilean dictator Augusto Pinochet realised in 2000, international journeys are an indulgence to be undertaken with extreme caution if your curriculum vitae includes the commission of war crimes, genocide or crimes against humanity.
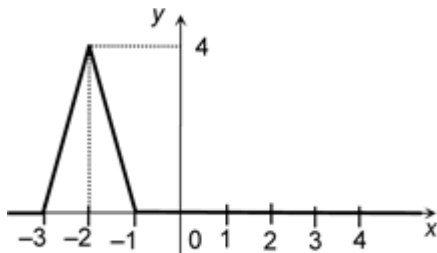
(1) DCBEA
(2) CDAEB
(3) CABED
(4) DBEAC
(5) BEDCA

Quantitative Ability

DIRECTIONS *for questions 21 to 38:* **Answer the questions independently of each other.**
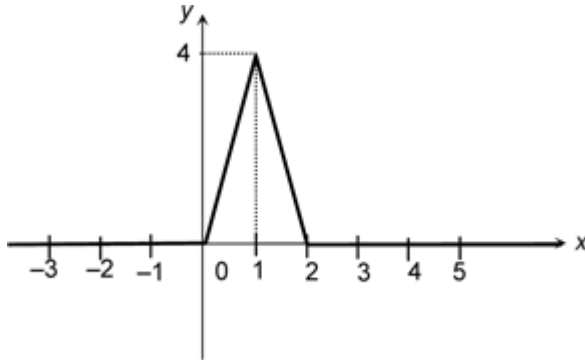
21.

(1)
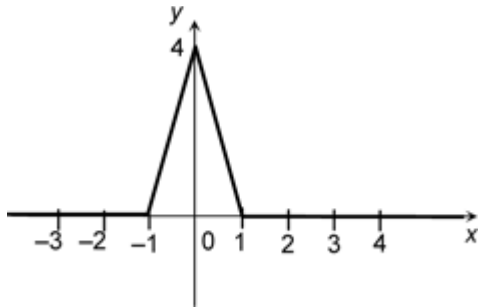
(2)
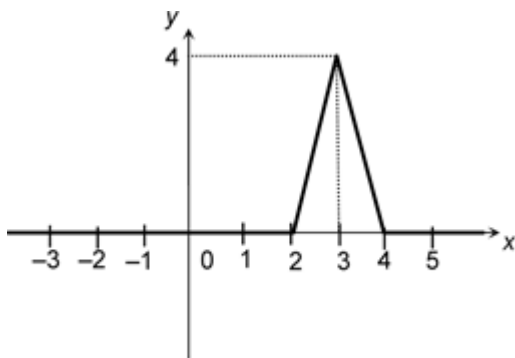
(3)
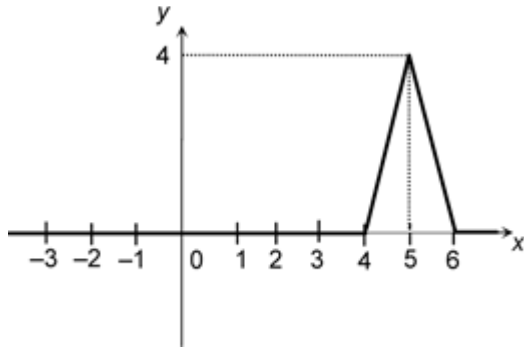
(4)

(5) None of these

22. **The perimeter of an equilateral triangle equals the perimeter of a rectangle. If one of the sides of the rectangle equals the side of the triangle, find the ratio of the areas of the triangle and the rectangle.**

(1) $\sqrt{3}:1$
(2) $\sqrt{3}:\sqrt{2}$
(3) $2\sqrt{3}:1$
(4) $2:\sqrt{3}$
(5) $\sqrt{3}:2$

23. **If $a^m = a^n$, where a is a real number, while m and n are integers, then which of the following must be true?**

(1) $m = n$
(2) If $m \neq n$, $a = 0$ or $a = 1$
(3) $m \neq n$
(4) $a = m^n$
(5) None of these

24. **A is a set of all those integers greater than 1 and less than 100 which are divisible either by 3 or by 4 but not by both. What is the index of the highest power of thousand that occurs in the product of all the elements of set A?**

(1) 9
(2) 7
(3) 3
(4) 4
(5) 6

25. **Chris and his wife invited a total of 10 families on their marriage anniversary. While the host family had just the two members, each**

family invited consisted of four members. If every person in the party shook hands with every other person belonging to a different family exactly once, then find the number of handshakes that took place in the party.

(1) 801
(2) 800
(3) 740
(4) 729
(5) None of these

26.   If $\dfrac{y + z - x}{x}, \dfrac{x + z - y}{y}$ **and** $\dfrac{x + y - z}{z}$ **are in arithmetic progression, then which of the following are in arithmetic progression?**

(1) x, y, z
(2) $x + y, x + z, y + z$
(3) $\dfrac{1}{x}, \dfrac{1}{y}, \dfrac{1}{z}$
(4) $\dfrac{1}{x + y}, \dfrac{1}{x + z}, \dfrac{1}{y + x}$
(5) None of these

27.   Working together, two workers completed a job in 5 days. Had the first worker worked twice as fast and the second worker half as fast, it would have taken them 4 days to complete the job. In how many days will the first person working alone, complete the entire job?

(1) 10 days
(2) 20 days
(3) 30 days
(4) 60 days
(5) 72 days

28.   A mathematics teacher asked each of her students to think of a natural number which was a perfect square and then convert it to a number system to the base of any natural number of their choice, where the base is not more than 9. The teacher later observed that though no two students took the same base, all the students in the class ended up with the same result of 12321. Find the maximum, possible number of students in the class.

(1) 9

(2) 8

(3) 7

(4) 6

(5) 5

29.   A rectangle ABCD, when rolled such that the two lengths AB and CD coincide becomes a cylinder of volume C_1. Similarly, when it is rolled such that the two breadths AD and BC coincide, it becomes a cylinder of volume C_2. If a square of the same area is rolled in a similar manner along one of its sides, a cylinder of volume C_3 is formed. Which of the following statements holds true?

(1) $C_3 > C_2 > C_1$

(2) $C_3 > C_1 > C_2$

(3) $C_2 > C_3 > C_1$

(4) $C_1 > C_3 > C_2$

(5) None of these

30.   The marked price and the cost price of a watch are in the ratio 4 : 3. The discount percentage offered before it was sold and the profit/loss percentage made on it are in the ratio 3 : 4. Find the profit/loss percentage.

(1) $8\frac{1}{3}\%$ Loss

(2) $4\frac{1}{3}\%$ Profit

(3) $8\frac{1}{3}\%$ Profit

(4) $16\frac{2}{3}\%$ Profit

(5) Cannot be determined

31.   What is the remainder when $(2^{469} + 3^{268})$ is divided by 22?

(1) 1

(2) 11

(3) 19

(4) 0

(5) 17

32.   Consider the expansion below:
$(3 + a + a^2 + a^3)^5 = C_0 + C_1a + C_2a^2 + \ldots\ldots C_{15}a^{15}$, where C_0, C_1, C_2,

……. C_{15} are all integers. Find the value of $\sum_{i=1}^{15} C_i$.

(1) 7433
(2) 7623
(3) 7777
(4) 7723
(5) 7533

33. **AB is the diameter of a circle with centre O and C is a point on the circle different from A and B. D is a point on BC such that OD ^ BC. E is a point on BD such that OE bisects ÐBOD and BE : ED = 2 : 1. If F is the midpoint of DC, find the length (in cm) of AF, given that AB = 24 cm.**

(1) $\sqrt{161}$
(2) $\sqrt{171}$
(3) $\sqrt{181}$
(4) $\sqrt{191}$
(5) $\sqrt{201}$

34. **If y is an even natural number not less than 4 and $x = y^2 - 2y$, then the largest number that always divides $x^2 - 8x$ is**

(1) 182
(2) 144
(3) 72
(4) 384
(5) 96

35. **Let S_n be defined as $S_n = t_0 + t_1 + t_2 + \ldots\ldots t_{n-1} + t_n$, where $t_n = (-1)^{n+1} (t_{n-1} + 1)$ and $t_0 = 1$. Find S_{199}.**

(1) -100
(2) 100
(3) -99
(4) -199
(5) -198

36. **In how many distinguishably different ways can a cube be painted using at most two colours - White and Black - such that each face is coloured with exactly one of the two given colours?**

(1) 24

(2) 16

(3) 10

(4) 12

(5) 14

37.   Ron Weasly, an amateur wizard from, Hogwarts, tried to teleport his brother's pet spider by casting a magical spell upon it. However, the spell had a rather different effect than what Ron intended it to have. The spider was thoroughly disoriented and started from the point where it was and first crawled 8 m towards South, then it crawled 4 m towards West, 2 m South, 1 m East, 50 cm South, 25 cm West, 12.5 cm South, 6.25 cm East and so on indefinitely. If P is the point from which the spider started, what is the location of the point Q that it finally approaches, in relation to P?

(1) Q is $\dfrac{32}{3}$ m to the South and $\dfrac{16}{5}$ m to the West of P.

(2) Q is $\dfrac{32}{17}$ m to the South and $\dfrac{32}{3}$ m to the West of P.

(3) Q is $\dfrac{16}{3}$ m to the South and $\dfrac{32}{17}$ m to the West of P.

(4) Q is $\dfrac{32}{3}$ m to the South and $\dfrac{16}{17}$ m to the West of P.

(5) None of these

38.   A cat, which is sitting inside a tunnel PQ, at a distance of 50 m from the end P, notices a train approaching the end P of the tunnel from the outside. Now, if the cat runs towards the end P, then the train would meet it exactly at P. If the cat runs towards the end Q instead, then the train would meet it exactly at Q. Which of the following is not a possible value of the length PQ (in m) of the tunnel?

(1) 130

(2) 120

(3) 110

(4) 100

(5) 105

DIRECTIONS *for questions 39 and 40:* Answer the questions on the basis of the information given below.

  A grid of horizontal and vertical lines forms *m* rows and *n* columns of rectangles, each of breadth *a* and length *b*, such that the breadth

of the entire grid is *ma*, while its length is *nb*. A straight line is now drawn, passing through the top left corner vertex and the bottom right corner vertex of the grid.

39.   If (*a*, *b*) = (2, 3) and (*m*, *n*) = (5, 7), at how many distinct points, including the top-left and the bottom- right corners, does the straight line intersect the grid lines?

(1) 5
(2) 12
(3) 6
(4) 13
(5) 15

40.   If (*a*, *b*) = (3, 4) and (*m*, *n*) = (4, 6), at how many distinct points, including the top-left and the bottom- right corners, does the straight line intersect the grid lines?

(1) 13
(2) 10
(3) 11
(4) 12
(5) 9

Logical & Data Interpretation

DIRECTIONS *for questions 41 to 44:* **Answer the questions on the basis of the information given below.**

A waiting room has 'n' equally spaced seats in a single row. The 1st person who enters the room can sit anywhere in the row. The 2nd person who enters, sits in the row such that he maintains maximum distance from the 1st person. The distance between any two persons is the number of seats between them (excluding their own seats). The 3rd person who enters, sits in the row such that the sum of his distances from the 1st and the 2nd person is maximum, and the process continues in the same way for all the remaining persons who enter the room.

41. If n = 17, find the maximum possible sum of distances of the 7th person from the 1st person to the 6th person.

(1) 35
(2) 37
(3) 36
(4) 40
(5) 42

42. If the maximum possible sum of distances of the 9th person from the 1st person to the 8th person is 36, find the value of 'n'.

(1) 17
(2) 15
(3) 19
(4) 13
(5) Cannot be determined

43. If n = 9, which of the following is not a possible seating arrangement, where '_' and 'p' denote an empty seat and an occupied seat respectively?

(1) p _ _ p _ _ _ p p
(2) p p _ _ p _ _ _ p
(3) p p _ _ _ _ _ p p
(4) p _ p _ _ _ p _ p
(5) None of these

44. If n = 13, then which among the following cannot be the sum of

the distances of the 8th person from the 1st person to the 7th person?

(1) 29
(2) 28
(3) 26
(4) 25
(5) None of these

DIRECTIONS *for questions 45 and 46:* **Answer the questions independently of each other.**

45.   It is believed by some cardiologists that a mechanical pump can be used as an artificial heart for those who suffer from a heart attack. Some experts however are in favour of only a human heart being used for patients who need a heart transplant.
Which of the following most seriously undermines the recommendation of mechanical pumps as an artificial heart?

(1) A heart transplant may not help patients who do not restrict the amount of salt in their diet.

(2) A major part of treatment for heart aliments is the post-operative regimen that results in strengthening of heart tissue and muscle.

(3) Only the human heart secretes a particular hormone that regulates blood pressure in the patient recuperating from a heart attack.

(4) There aren't many cardiologists who understand how a mechanical pump could be made to work efficiently.

(5) What it is that enables the body to accept an artificial heart is yet to be understood.
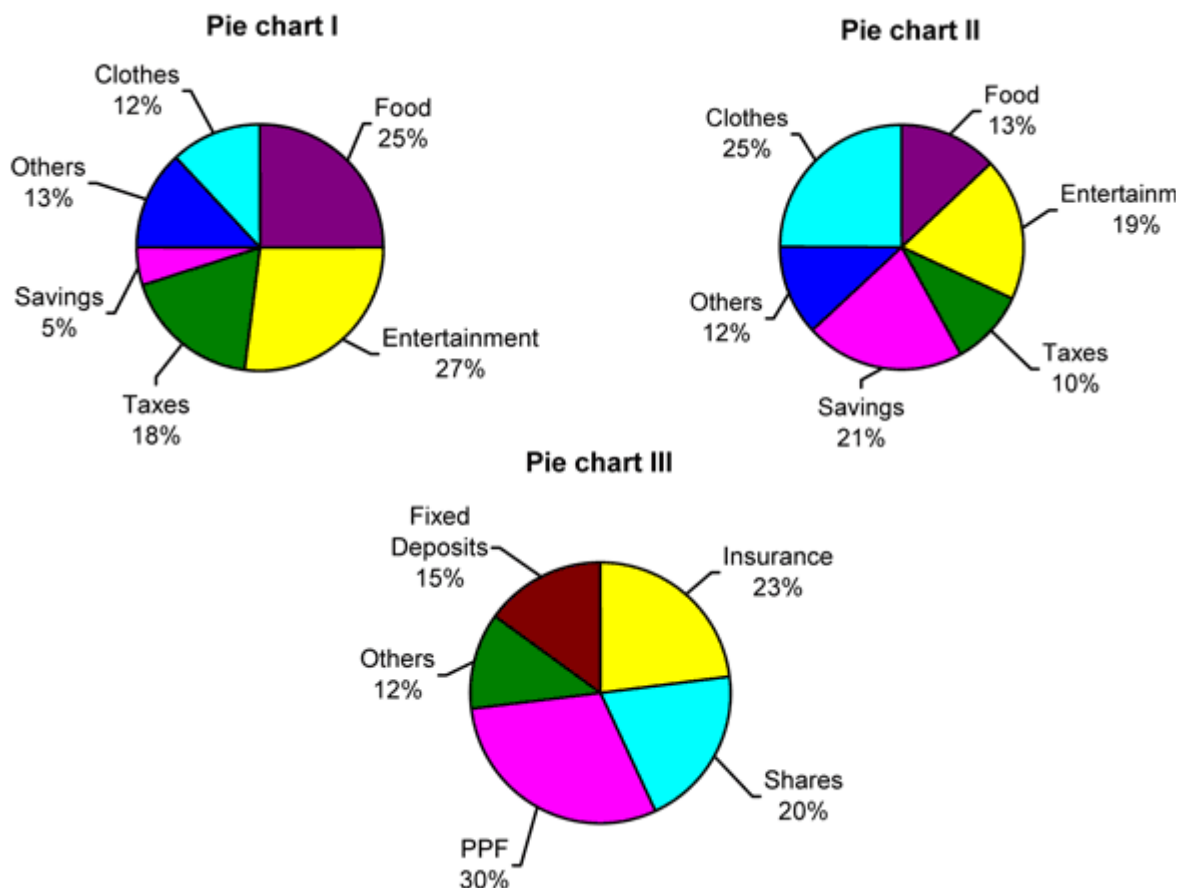
46.   Szymanski suggests that the problem of racism in football may be present even today. He begins by verifying an earlier hypothesis that clubs' wage bills explain 90% of their performance. Thus, if players' salaries were to be only based on their abilities, clubs that spend more should finish higher. If there is pay discrimination against some group of players - fewer teams bidding for black players thus lowering the salaries for blacks with the same ability as whites - that neat relation may no longer hold. He concludes that certain clubs seem to have achieved much less than what they could have, by not recruiting black players.
Which one of the following findings would best support Szymanski's conclusion?

(1) Certain clubs took advantage of the situation by hiring above-average shares of black players.

(2) Clubs hired white players at relatively high wages and did not show proportionately good performance.

(3) During the study period, clubs in towns with a history of discrimination against blacks, under-performed relative to their wage bills.

(4) Clubs in one region, which had higher proportions of black players had significantly lower wage bills than their counterparts in another region which had predominantly white players.

(5) Black players are as good as white players, in any circumstances and conditions.

DIRECTIONS *for questions 47 to 50:* Answer the questions on the basis of the information given below.

  Pie chart I and Pie chart II show the break up - according to different expenditure heads and savings - of the incomes of Mr. and Mrs. Anand respectively. Pie chart III shows the break up - according to the type of savings - of the total savings of the couple (i.e., the savings of Mr. and Mrs. Anand put together).

Pie chart I

Clothes 12%
Food 25%
Others 13%
Savings 5%
Entertainment 27%
Taxes 18%

Pie chart II

Food 13%
Clothes 25%
Entertainm 19%
Others 12%
Taxes 10%
Savings 21%

Pie chart III

Fixed Deposits 15%
Insurance 23%
Others 12%
Shares 20%
PPF 30%

47.   If Mr. Anand's savings are twice the total savings of the couple invested in fixed deposits, what is the ratio of the income of Mr. Anand to that of Mrs. Anand?

(1) 7 : 3
(2) 3 : 7
(3) 5 : 9
(4) 9 : 5
(5) None of these

48.   If the ratio of the income of Mr. Anand to that of Mrs. Anand is 3 : 1, the total savings of the couple invested in PPF as a percentage of Mr. Anand's savings are

(1) 50%
(2) 65%
(3) 72%
(4) 78%
(5) 70%

49.   If for an income of upto Rs.1 lakh, no tax is charged and for any income above Rs.1 lakh, the rate of tax for males and females is 30% and 20% respectively of the income in excess of Rs.1 lakh, then what is the ratio of the income of Mr. Anand to that of Mrs. Anand?

(1) 3 : 4
(2) 5 : 4
(3) 4 : 5
(4) 23 : 22
(5) None of these

50.   If the expenditure on clothes by Mr. Anand and that by Mrs. Anand are in the ratio 2 : 5, then what is the ratio of the income of Mrs. Anand to that of Mr. Anand?

(1) 5 : 6
(2) 4 : 5
(3) 5 : 4
(4) 3 : 5
(5) None of these

DIRECTIONS *for questions 51 to 54:* Answer the questions on the basis of the information given below.
   Each person, out of the 200 people in a certain community, speaks at least one language among English, Spanish and French. 37% of the people speak at least two of the three languages, while 15% of

the people speak only Spanish. It was also known that 23% of the people speak English and French, while 20% speak English and Spanish and 12% speak all the three languages.

51. If the number of people who speak English is less than that of those who speak French, at least what percentage of the people do not speak English?

(1) 46.50%
(2) 41.50%
(3) 39.50%
(4) 37.50%
(5) 42.50%

52. If the number of people who speak Spanish is less than that of those who speak English, then at most what percentage of the people speak French but not Spanish?

(1) 46.50%
(2) 48.50%
(3) 53.50%
(4) 50.50%
(5) None of these

53. If the total number of people who speak English is twice that of those who speak French, what percentage of the people speak English or Spanish?

(1) 82%
(2) 84%
(3) 87%
(4) 93%
(5) 91%

54. If the number of people who speak French or Spanish is 144. Then what is the ratio of number of people who speak Spanish to that of English?

(1) 41 : 59
(2) 59 : 41
(3) 58 : 41
(4) 41 : 58

(5) None of these

DIRECTIONS *for questions 55 to 57:* **Answer the questions on the basis of the information given below.**

The following table gives the percentage of marks scored by three students - Ramu, Rakesh and Rohan, in five subjects. The maximum mark in two of the five subjects is 50 and the maximum mark in the other subjects is 100. Further, the marks scored by any person in any subject need not be an integer.

Subject	Student		
	Ramu	Rakesh	Rohan
A	80%	84%	52%
B	68%	85%	88%
C	56%	72%	76%
D	92%	63%	60%
E	76%	66%	80%

55. **If it is known that Rohan had the highest total marks among the three, then how many marks did Ramu score in total?**

(1) 372
(2) 286
(3) 284
(4) 312
(5) Cannot be determined

56. **If Ramu scored 72% marks in total, then for which two subjects was the maximum mark 50?**

(1) A and E
(2) B and D
(3) A and B
(4) C and E
(5) None of these

57. **Which two subjects had the maximum mark as 50, if it is known that Rakesh had the highest total marks among the three?**

(1) A and E
(2) B and D
(3) C and D

(4) C and B

(5) Cannot be determined

DIRECTIONS *for questions 58 and 59:* **Answer the questions on the basis of the information given below.**

In a Hockey Tournament, exactly three teams participated. Each team played exactly one match with the other two teams. The total number of goals scored by the teams in the three matches played were 9, 7 and 5, not necessarily in any specific order. At the end of the tournament, the teams with the highest, second highest and least number of matches won are declared as the Winner, the Runner-up and the Loser, respectively.

In the tournament, the total number of goals scored by the Winner is distinctly the highest and the Loser scored three goals less than the Winner.

The average goal difference (the difference between the number of goals scored by the two teams in a match) in the tournament was 1.

58.   What is the total number of goals scored by the Runner-up in the tournament?

(1) 8

(2) 7

(3) 6

(4) 4

(5) 5

59.   If the 12th goal in the tournament, made during one of the matches, made one of the teams win that match, then it could have been scored by
I) The Winner over the Loser
II) The Runner-up over the Loser
III) The Winner over the Runner-up

(1) Only I or II

(2) Only II or III

(3) Only I or III

(4) Only I

(5) Cannot be determined

DIRECTIONS *for question 60:* **Answer the questions independently of each other.**

60. **Ashok, Akash, Akshay, Amar and Anoop are at a Party and are having a cocktail each. Each cocktail is made using exactly two drinks from among -Whisky, Brandy, Rum, Gin and Vodka. The cocktails are named A, B, C, D and E. Whisky and Vodka cannot be mixed together. Brandy cannot be mixed with Rum or Vodka. Amar takes drinks made only from among Brandy, Rum, Gin and Vodka. Akash's cocktail is made by mixing Whisky and Brandy. Ashok does not take anything containing Whisky, Rum or Vodka. Akash, Ashok and Anoop are having cocktails A, B and C respectively. Cocktails A and E have exactly one drink in common. Only cocktails C and D are made from the same two drinks. The cocktail of Akshay can contain**

(1) Gin and Rum
(2) Rum and Vodkha
(3) Gin and Whisky
(4) Gin and Brandy
(5) None of these

SOLUTIONS

Verbal Ability

1. **Number of words and Explanatory notes for RC:**

Number of words : 504

Refer to paras (1) and (2), which point to option 4 as the answer. The passage suggests the long sought after theory of the Universe hinges on resolving the concept of time, option (1) incorrectly suggests that scientists differ on the notion of quantum gravity. Options (2) and (3) are related ideas suggested in the passage, but do not answer the question. Option (5) is also distorted. Quantum mechanics does not challenge the concept of time. It has not been able to fit in time.   Choice (4)

2. **Number of words and Explanatory notes for RC:**

Number of words : 504

Option (1) is the answer. Quantum theory of gravity is not yet been outlined. It is still long sought after (Refer to para (1). Besides, refer to the last two sentences of the passage, which clearly indicate that this statement has no factual basis. Other options can be supported by the idea provided in the passage.   Choice (1)

3. **Number of words and Explanatory notes for RC:**

Number of words : 504

Option (5) can be ruled out as it only talks about the universe, which is not the central idea. Option (4) can be ruled out as it does not contain the idea that people are struggling to define time. Since the passage deals with time, as a continuous issue, and the description of universe is just incidental contingent on a thorough understanding of time, we can rule out option (3). Further, the phrase 'universal theory' is inapt. Option (1) can be ruled out, as it does not focus on time. Option (2) is the right answer choice as it encapsulates the central idea of the passage.   Choice (2)

4. **Number of words and Explanatory notes for RC:**

Number of words : 695

The author does not recollect the past. He describes a scene and indulges in reflection. So, choice (1) is not apt. Choice (2) is not the focus. Will wreck peace on earth in choice (4) is not stated. The first half of choice (5) – slowing down pace of activity is not suggested. Choice (3) is the main idea. Refer to para (4) and the last para.   Choice (3)

5. **Number of words and Explanatory notes for RC:**

Number of words : 695

The sentence appears in the fifth para. In the entire para, the author suggests that when we look at things in Nature, we don't ever feel that they could be better than how they are. Productivity (more or less) is measured in man's world, not nature's world. So, choice (3) is the idea conveyed. Choice (3)

6. **Number of words and Explanatory notes for RC:**

Number of words : 695

Self-sufficient is being able to meet one's needs. The passage say 'Nature schools us in sufficiency' and enoughness at every turn (para 4). So, the principal lesson is contentment. Choice (2)

7. **Number of words and Explanatory notes for RC:**

Number of words : 695

In the fifth para, the author talks about interdependence and how everything is connected in Nature. So, we have to look for an idea which establishes the interconnectivity or link. Choice (2) is the best pick. Choices (1) and (3) are incomplete and vague. Choice (4) incorrectly includes fauna. Choice (5) is distorted. The control is not on the usage of nitrogen. Choice (2)

8. **Number of words and Explanatory notes for RC:**

Number of words : 1,145

Refer to para 9, last sentence which has the words in quote. The next para says medicines that actually cure diseases came only after the world wars. Choice (5)

9. **Number of words and Explanatory notes for RC:**

Number of words : 1,145

Refer to para 2 which mentions the 'background noise', which is an annoyance and the reason which follows backs choice 2. Choice (2)

10. **Number of words and Explanatory notes for RC:**

Number of words : 1,145

In the first para the author talks of the healing power of placebo (which is an observation, not a question, dilemma, procedure or concept). In the last para, he recommends how best this can be used in healing. Choice (1)

11. **Number of words and Explanatory notes for RC:**

Number of words : 1,145

Refer to para 4, last sentence. The federal funding for research bespeaks the importance that has been recognized. Choice 5 is ruled out as it is too specific. Choice (3)

12. Choice (1) is ruled out as "misapprehension about" is incorrect. It is "misapprehension of". Further, in the given sentence, the comparison is between "our misapprehension with the nature of language" and "all the other mistakes", hence, "than other mistakes" is incorrect. The correction is "than all the other mistakes" The preposition 'with' in choice (3) suggests that it is incorrect. Further, the past tense used in the sentence also makes it an incorrect choice. Similarly, the past perfect tense (had occasioned) in choice (4) also makes it incorrect. It also has a prepositional error i.e., "delusions through which". 'Misappropriation with' as used in choice (5) is incorrect. It is 'Misappropriation of'. Further the erroneous structure (the other mistakes) just as in choice (1) also renders it incorrect. Hence only choice (2) is grammatically correct.

Choice (2)

13. The underlined part of the sentence is a conditional clause. Since it begins with a perfect conditional (might have), it should take the past perfect tense i.e., (had it not been) which is found only in choices (2) and (3) and this rules of choices (1), (4) and (5).
Besides, choices (2) and (4) begin in the past tense (might take) but the use of past perfect (had it not been) in the latter part of the sentence, makes them incorrect. Further, the phrase "many a gladiatorial fights", as used in choices (1), (2) is incorrect. The correction is many a gradational fight. The preposition 'to' after 'venue' in choice (1) and (5) also renders these choices incorrect. Hence only choice (3) has no errors.

Choice (3)

14. In all the five options we find different variations in the way the correlative conjunction "not just ...... but also" is used in the sentence. When a correlative conjunction is used in a sentence, each correlated part of the conjunction must immediately precede the worlds / phrases being connected. Further, when a correlative conjunction is used in a sentence, the part of the sentence following each of the correlated part must be of the same grammatical form. This is found in choices (2) and (4). 'And explanation of' and 'explanation on' as used in choices (2) and (5) respectively are also incorrect. 'Explanation for' is the correction, we 'provide explanation for'. In choices (2) and (5) the use of 'telling something' is incorrect. 'Tell' is a transitive verb which needs an object after it. Hence, 'telling us something' is the correction. Hence, choice (4) is grammatically correct.

Choice (4)

15. The paragraph indicates that certain decision makers discuss such matters with their teams that they themselves have doubts about, to confirm whether their doubts are genuine and are shared by their teams. This being the case –
Statement (A) can be Logically Concluded since, once their doubts are confirmed, they would put those ideas aside and proceed with the ones they are more definite about.
Statement (B) is Far-Fetched since this could be the case only if the decision makers have no clear ideas of their own on anything.
Statement (C) is Irrelevant since the use of the phrase "out of hand" indicates that the decision makers dismiss an idea immediately, without even allowing a discussion – while the paragraph focuses on ideas discussed.
Statement (D) is Contrary to the thought in the paragraph since this indicates that the decision makers discuss those ideas that they want to convince their teams of, and not the ones they have doubts about.
Statement (E) is Irrelevant since it focuses on the way advisers approach the discussion, not the decision makers.

Choice (4)

16. The paragraph looks at two symbiotic relationships in the natural scheme of pollination – one where certain bees are so adapted that they feed off and pollinate only a single species of plant, and the other where certain plants have so evolved that they can be fed off and pollinated only by a single species of bee. The following thought is that the extinction of one party to the symbiotic arrangement puts the other party at risk. This being the case –
Statement (A) is Contrary to the thought in the paragraph, (whether one plant supports various bee species, or, one bee species supports various plants) : (i) In the first case, the extinction of the plant would mean the extinction of the dependant bees, according to the paragraph, so the idea of continued survival is contrary. (ii) In the second case, the extinction of some plants may leave some others that the bee can survive on, and therefore no mutation need happen.
Statement (B) can be Logically Concluded since there is no primary risk that is then transferred to the partner.
Statement (C) is Irrelevant since it speaks of those bees that are not specially adapted, not the focus of the paragraph.
Statement (D) is Irrelevant since it does not fall under the L, C or F categories – it merely provides an additional piece of information indicating that most plants have evolved to attract some species of bees and not others.
Statement (E) can be Logically Concluded in the same manner as the last statement in the paragraph, since the extinction of one party puts the other at risk.   Choice (2)

17. The paragraph indicates that a computer network serves two sorts of functions: it can serve as a private message service (akin to the telephone system, and therefore responsible for transmission) or as a publicly accessible information service (akin to a public broadcasting systems, and therefore responsible for content). It also takes this thought further to indicate that, because of the dual responsibility, regulation of computer networks cannot be modelled on (mere replication of) past legislation that was applicable to those two systems independently. This being the case –
Statement (A) is Irrelevant since it does not fall under the L, C or F categories – it is a reason for the regulation of computer networks, something that can be understood from the paragraph, but not a conclusion drawn from it.
Statement (B) is Far-Fetched since it rules out the possibility (therefore induces the impossibility) that relevant and applicable portions could be used from past legislations; this would not constitute mere replication or blind application.
Statement (C) is Irrelevant since it speaks of how computer networks were developed and not of how they should be regulated.
Statement (D) is Far-Fetched since it rules out the possibility (therefore induces the impossibility) that legislators could be properly guided and advised by experts, or could study the matters to learn what they need to know.
Statement (E) is Contrary to the thought in the paragraph since it indicates that mere replication of both models, read together, is adequate.   Choice (5)

18. Only E can follow C as it explains why we are living in a world of crisis. B is a further elaboration of what is stated in E. Hence B follows E. D is a continuation of B. 'In the face of all this' in D refers to the problems mentioned in the preceding sentences E and B. A concludes the para by saying that we seek an escape from the problems we are now facing by looking back with nostalgia to the earlier dream of an ideal world. Hence, CEBDA is the correct sequence.   Choice (2)

19. Only E can follow C as 'the victims' in C refer to the air tragedy mentioned in C. A follows E, the word however in A contrasts with what is stated in E. While E speaks about how the Indians have reacted to the tragedy despite the fact that most of the victims were of Indian origin, C speaks about how the victims' rights groups in Canada brought pressure on the government. D carries forward the idea expressed in A. B concludes the para. 'The report' in B refers to the 'findings' mentioned in D. Hence, CEADB is the correct sequence.   Choice (4)

20. Statement D is the opening sentence of the paragraph as it states the main idea, i.e., individuals who violate human rights can no longer be shielded by the walls of national sovereignty. B elaborates on what is stated in D. E corroborates what is stated in B by citing examples. A follows E by expressing the author's opinion on this issue. C complements what is stated in the preceding statements and is hence conclusive in nature. Hence, DBEAC is the correct sequence.   Choice (4)
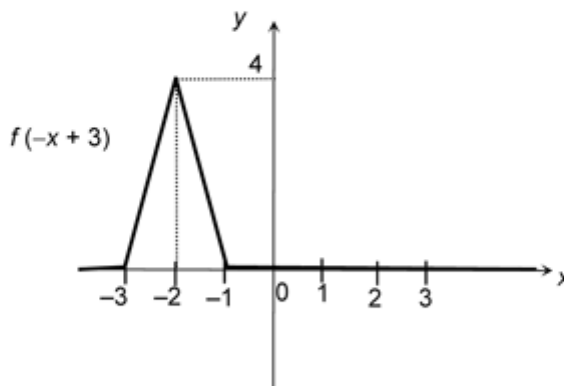
Quantitative Ability

21. $f(x)$ is obtained by shifting the given graph of $f(x + 4)$ by 4 units to the right side,
    $\therefore f(x)$ is
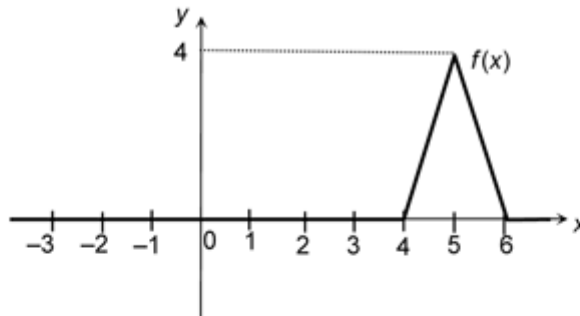
$\therefore f(-x + 3)$ is obtained, by first reflecting the above graph (of $f(x)$) about the y-axis (to obtain $f(-x)$) and then shifting it to the right by 3 units.

Note: In general, for $k > 0$, $f(x + k)$ is obtained by shifting $f(x)$ to the left, while $f(-x + k)$ is obtained by shifting $f(-x)$ to the right.

Alternative solution:

It can be seen from the graph that y is maximum when $x = 1$ i.e., $y = f(5)$. Since the function $f(3 - x)$ is only a linear transformation of $f(x + 4)$, $f(3 - x)$ will also attain its maximum when $f(3 - x) = f(5)$ or $3 - x = 5 \Rightarrow x = -2$. From the choices, only (1) satisfies.   Choice (1)

22. Let the side of the triangle be a. Let the length and the breadth of the rectangle be l and b respectively.
    $3a = 2(l + b)$

    If $l = a$, $b = \dfrac{a}{2}$

    If $b = a$, $l = \dfrac{a}{2}$

    $b > l$ which is not possible.

    $\therefore l = a$ and $b = \dfrac{a}{2}$

    Area of the rectangle = $\dfrac{a^2}{2}$

    Area of the triangle = $\dfrac{\sqrt{3}}{4} a^2$

    Required ratio = $\sqrt{3} : 2$ Choice (5)

23. Given $a^m = a^n$
$a = 1$ or 0 or -1 or $m = n$
Hence none of choices (1), (2), (3) or (4) needs to be true when $a = -1$.   Choice (5)

24. The integers to be considered are between 2 and 99, both being inclusive. If A1 is the set of all integers between 2 and 99, which are divisible by 3, then the elements of A1 are:
$\{3, 6, 9, 12, 15, 18, 21, 24.......96\} \rightarrow (1)$
If A2 is the set of all integers between 2 and 99, which are divisible by 4, the elements of A2 are:
$\{4, 8, 12, 16, 20, ...96\} \rightarrow (2)$
Highest power of 1000 is to be obtained. Hence, first highest power of 10 needs to be determined.
10 is contributed by
1) by 10 and multiples of 10,
2) by multiplying multiples of 5 with 2.
(1) Contains multiples of 5 and they are 15, 30, 45, 60, 75, 90 out of these 60 is divisible by 12 and hence it is to be deleted $\rightarrow (3)$
(2) Contains multiples of 10s, and they are 20, 40, 60, 80, out of which 60 is a multiple of 12, hence deleted.
Hence, in the product of elements of set A, we have (to get a multiple of 10)
$15 \times 30 \times 45 \times 75 \times 90 \times 20 \times 40 \times 80$
i.e., $10^5 \times 5^4 \times 3^7 \times 2^6$
i.e. $10^5 \times (5^4 \times 2^4) \times 3^7 \times 2^2$
i.e., $10^9 \times 3^7 \times 2^2$
No other elements of set A or their product contributes a factor of 10.
Hence, the highest power of 10 is 9 and hence the highest power of one thousand i.e., 10^3 is 3.   Choice (3)

25. Total number of people in the party is 42. The total number of handshakes, if every person were to shake hands with every other person exactly once is $^{42}C_2$.
This includes handshakes between the family members, which need to be discounted.
Number of possible handshakes between 4 members of the same family is $^4C_2$
$\therefore$ Total number of handshakes $= {}^{42}C_2 - 10\,({}^4C_2) - 1 = 800$
(we subtract 1 to discount the handshake between Chris and his wife).   Choice (2)

26. Add 2 to all three terms, they become $\dfrac{y+z-x}{x} + 2$, $\dfrac{x+z-y}{y} + 2$ and $\dfrac{x+y-z}{z} + 2$ respectively.
i.e. $\dfrac{x+y+z}{x}$, $\dfrac{x+y+z}{y}$ and $\dfrac{x+y+z}{z}$ respectively.
These resultant terms are in A.P.
So $\dfrac{1}{x}, \dfrac{1}{y}, \dfrac{1}{z}$ are also in A.P.   Choice (3)

27. Given (first person + second person)
One day's work = 1/5
$\Rightarrow$ i.e., F + S = 1/5 ---------- (1)
$\Rightarrow$ i.e., 2 F + S/2 = 1/4   ---------- (2)
$2 \times (2) - (1) \Rightarrow 3 F = 3/10$
F = 1/10 i.e., 10 days.   Choice (1)

28. Let us say for a base n, $(n \leq 9)$, 12321 is a perfect square when expressed as a decimal.

$(12321)_n = n^4 + 2n^3 + 3n^2 + 2n + 1 = n^4 + n^2 + 1 + 1 + 2n^3 + 2n^2 + 2n + 1 = (n^2 + n + 1)^2$.

n must be a minimum of 4, since the digit 3 is used.

∴ For values of n from 4 to 9 (i.e., six distinct values of n), $(12321)_n$ when expressed as a decimal is a perfect square.

⇒ at most 6 students could be there in the class.   Choice (4)

29. Let the area of the rectangle be A

⇒ $\ell b = A$

The cylinder having a volume of C_1 will have a height of ℓ and a circumference of b. Its volume = C_1

$= \pi \left(\dfrac{b}{2\pi} \right)^2 \ell = \dfrac{b^2 \ell}{4\pi} = \dfrac{Ab}{4\pi}$

$C_2 = \pi \left(\dfrac{\ell}{2\pi} \right)^2 b = \dfrac{A\ell}{4\pi}$

C_3 is formed from a square of side $\sqrt{\ell b}$

$C_3 = \pi \left(\dfrac{\sqrt{\ell b}}{2\pi} \right)^2 \sqrt{\ell b} = \dfrac{A \sqrt{\ell b}}{4\pi}$

As $\ell > b$, $b < \sqrt{\ell b} < \ell$

∴ $C_2 > C_3 > C_1$

Alternative solution:

Assume that ABCD is a rectangle of length = 2 cm and breadth = $\dfrac{1}{2}$ cm

Also, let the side of the square be 1 cm

The height of C_1 = length of ABCD = 2 cm

The radius of C_1 ∝ breadth of ABCD = $\dfrac{1}{2}$ cm

⇒ volume of C_1 ∝ $r^2 h$, i.e., $\left(\dfrac{1}{2} \right)^2 \times 2$

Similarly volume of C_2 ∝ $(2)^2 \times \left(\dfrac{1}{2} \right)$

And volume of C_3 ∝ $(1)^2 \times 1$

Clearly $C_2 > C_3 > C_1$ Choice (3)

30. Let the marked price and the cost price be Rs.$4x$ and Rs.$3x$ respectively.

Let the discount percentage and the profit/loss percentage be $3y\%$ and $4y\%$ respectively.

S.P. = M.P. – D = C.P. ± P

$$4x\left(1-\frac{3y}{100}\right)=3x\left(1\pm\frac{4y}{100}\right) \quad\ldots\ldots(1)$$

If profit is made $x = \dfrac{24xy}{100}$, $y = \dfrac{25}{6}$

If loss is made, L.H.S. of (1) exceeds R.H.S. of (1)

∴ loss cannot be made.

The percentage profit is $4y\% = \dfrac{100}{6}\% = 16\dfrac{2}{3}\%$

Alternative solution:

Since discount percentage = $\dfrac{\text{discount}}{\text{market price}} \times 100$ and profit percentage = $\dfrac{\text{profit}}{\text{cost price}} \times$ 100, ratio of discount percentage = $\dfrac{d}{MP} : \dfrac{p}{CP}$.

When $d = p$, the ratio becomes MP : CP.

In this case, ratio of discount % to profit % = 3 : 4 and ratio of MP to CP is 4 : 3.

∴ Discount = Profit.

∴ Say marked price is 8 ⇒ Cost price = 6

⇒ Selling price = $\dfrac{6+8}{2} = 7$

∴ Profit % = $\dfrac{1}{6} = 16\dfrac{2}{3}\%$

Choice (4)

31. Let $E = 2^{469} + 3^{268} = (2^7)^{67} + (3^4)^{67} = 128^{67} + 81^{67}$
We know that for odd value of n, $a^n + b^n$ is a multiple of $(a + b)$.
So, E is divisible by 209. $209 = 11 \times 19$
Since $E = 11 \times 19 \times$ (an odd number),
$\Rightarrow E = 11 \times 19 (2K + 1) = (2K \times 11 \times 19) + 209$
$\therefore$ Rem $\left(\dfrac{E}{22}\right) =$ Rem $\left(\dfrac{209}{22}\right) = 11$.

Alternative solution:

Rem $\left(\dfrac{2^{469} + 3^{268}}{22}\right) =$ Rem $\left(\dfrac{2^{469}}{22}\right) + R\left(\dfrac{3^{268}}{22}\right)$

Now, Rem $\left(\dfrac{2^{469}}{22}\right) = 2$ Rem $\left(\dfrac{2^{468}}{11}\right)$

Rem $\dfrac{2^5}{11} = -1 \Rightarrow$ Rem $\left(\dfrac{2^{469}}{22}\right)$

$= 2$ Rem $\left(\dfrac{2^{10}}{11}\right)^{46} \times$ Rem $\left(\dfrac{2^8}{11}\right) = 2 \times 1 \times 3 = 6$

One can also Fermat's little theorem i.e., Rem $\dfrac{a^{p-1}}{p} = 1$ when p is prime and p is not a factor of 'a'.

To find Rem $\dfrac{3^{268}}{22}$, we observe that $22 = 2 \times 11$ [Express as a product of two co-primes].

Now, Rem $\dfrac{3^{268}}{2} = 1$

Rem $\dfrac{3^{268}}{11} =$ Rem $\dfrac{(3^{10})^{26} \times 3^8}{11} = 1 \times$ Rem $\dfrac{(3^2)^4}{11} =$ Rem $\dfrac{(-2)^4}{11} = 5$

If a number when divided with 2 leaves a remainder 1 and when divided with 11 leaves a remainder 5, the smallest such number is 5.
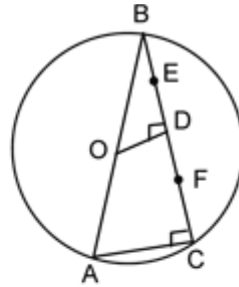
$\therefore$ Rem $\dfrac{3^{268}}{22} = 5$

$\therefore$ Rem $\left(\dfrac{2^{469} + 3^{268}}{11}\right) = 6 + 5 = 11$ Choice (2)

32. Putting $a = 0$, $3^5 = C_0$
Putting $a = 1$, $6^5 = C_0 + C_1 + C_2 + \ldots C_{15}$
$\therefore \sum\limits_{i=1}^{15} C_i = 6^5 - 3^5 = 7533$ Choice (5)

33.

$\angle ACB = 90°$ (angle in a semicircle)
As OE bisects $\angle BOD$,
BE : ED = OB : OD
$\therefore OB = 2OD$
OB = 12 cm ($\because AB = 24$ cm)
$\Rightarrow OD = 6$ cm
$BD = \sqrt{OB^2 - OD^2} = 6\sqrt{3}$ cm
Triangles OBD and ABC are similar, with the ratio of corresponding sides equal to 2 : 1.
$\therefore AC = 2\ OD = 12$ cm
$BC = 2\ BD = 12\sqrt{3}$ cm
$\Rightarrow DC = BC - BD = 6\sqrt{3}$ cm
F is midpoint of DC
$\Rightarrow FC = \dfrac{DC}{2} = 3\sqrt{3}$ cm
$\therefore AF = \sqrt{AC^2 + CF^2} = \sqrt{171}$ cm
Choice (2)

34. $x^2 - 8x = (y^2 - 2y)^2 - 8(y^2 - 2y) = (y^2 - 2y)(y^2 - 2y - 8) = y(y - 2)(y - 4)(y + 2)$
Let $y = 2k$, where k is a natural number.
$x^2 - 8x = 2k(2k - 2)(2k - 4)(2k + 2) = 16(k - 2)(k - 1)(k)(k + 1)$
$k - 2, k - 1, k$ and $k + 1$ are four consecutive natural numbers.
$\therefore$ their product is possible by 24.
$\therefore x^2 - 8x$ is divisible by (16) (24) i.e. 384

Alternative solution:

$x = y^2 - 2y$ and x is an even natural number.
Substitute values of x and check $y = 6 \Rightarrow x = 36 - 12 = 24$
$\therefore x^2 - 8x = 24^2 - 8 \times 24 = 24 \times 16 = 384$
Clearly, the largest number which divides 384 is 384 itself.
Choice (4)

Note : Students are advised to be judicious when using 'shortcuts' in solving problems. It is only when one is strong in fundamentals and has a thorough grasp of the concepts involved that 'out-of-the-box' solutions can be explored. Given that in CAT, no student is awarded additional marks for flair and flamboyance, when in doubt, choosing substance over style is recommended.

35. Given, $t_n = (-1)^{n+1} (t_{n-1} + 1)$ and $t_0 = 1$
$t_1 = (-1)^2 (t_0 + 1) = 1(1 + 1) = 2$;
$t_2 = (-1)^3 (2 + 1) = -3$
$t_3 = (-1)^4 (-3 + 1) = -2$;
$t_4 = (-1)^5 (-2 + 1) = 1$
$t_5 = (-1)^6 (1 + 1) = 2$;
$t_6 = (-1)^7 (2 + 1) = -3$
$t_7 = (-1)^8 (-3 + 1) = -2$;
$t_8 = (-1)^9 (-2 + 1) = 1$
So, we can observe that the series repeats with a period of 4 starting with t_0.
S_{199} is the sum of 50 such complete cycles, from 0 to 19
i.e. $S_{199} = 50 (t_0 + t_1 + t_2 + t_3) = 50 (1 + 2 - 3 - 2) = 50 (-2) = -100$.   Choice (1)

36. A cube has 6 faces. The following are the number of ways in which the cube can be coloured using two colours to give different configurations:
6 black, 0 white; 0 black, 6 white → 2 ways
1 black, 5 white; 5 black, 1 white → 2 ways
2 black, 4 white → 2 ways (when the blacks are adjacent and the black are opposite)
2 white, 4 black - 2 ways
3 black, 3 white - 2 ways (when all three are adjacent and when two are opposite and one adjacent)
∴ Total = 10 ways   Choice (3)

37. Every alternate stretch is towards South. The second stretch is towards West, while the fourth is towards East. We can take distances covered towards East as negative distances towards West. The insect's motion can thus be viewed as follows.

Towards South	8	2	1/2	1/8
Towards West		4	−1	1/4

∴Net distance towards South is $\dfrac{8}{1-\dfrac{1}{4}} = \dfrac{8(4)}{3} = \dfrac{32}{3}$ and

Net distance towards West is $\dfrac{4}{1+\dfrac{1}{4}} = \dfrac{16}{5}$ Choice (1)

38. Let the length of the tunnel be d m. Let the train's present position be y m from P. Let the speeds of the train and the cat be t kmph and c kmph respectively. If the cat moves towards P, ratio of the distances travelled by the train and the cat before meeting would be the ratio of their speeds.
∴ $\dfrac{50}{y} = \dfrac{c}{t}$

Similarly, if the cat moves towards Q, $\dfrac{d-50}{y+d} = \dfrac{c}{t}$

⇒ $\dfrac{d-50}{y+d} = \dfrac{50}{y}$

$d = \dfrac{2(50y)}{y-50} = 100 \times \left(\dfrac{y}{y-50}\right)$

Now, since $y - 50 < y$ ∴ $d > 100$
Choice (4) does not satisfy this condition.   Choice (4)

39. In the grid ABCD, the diagonal AC intersects every vertical line between AD and BC and every horizontal line between AB and DC. All these points are distinct, unless one of them is a corner point obtained say after m_1 rows and n_1 columns. In such a case m has to be km_1 and n has to be kn_1, i.e., is a common divisor of m and n.
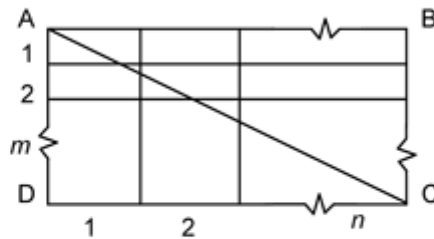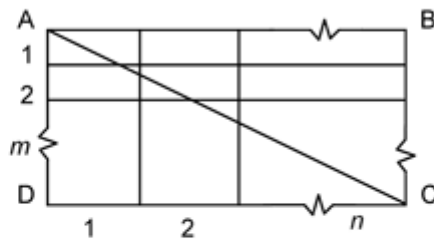

If there is no common divisor for m and n i.e., if m and n are relatively prime, there are $n + 1$ points of intersection with the $n + 1$ vertical lines and $m + 1$ points of intersection with the $m + 1$ horizontal lines. Only the points A and C have been counted twice. Hence, in this case, the total number of points of intersection is $(m + 1) + (n + 1) - 2 = m + n$.

$(m, n) = (5, 7)$ GCD $(5, 7) = 1$, i.e., 5 and 7 are relatively prime.
∴ Number of points of intersection = 5 + 7 = 12   Choice (2)

40. In the grid ABCD, the diagonal AC intersects every vertical line between AD and BC and every horizontal line between AB and DC. All these points are distinct, unless one of them is a corner point obtained say after m_1 rows and n_1 columns. In such a case m has to be km_1 and n has to be kn_1, i.e., is a common divisor of m and n.

If there is no common divisor for m and n i.e., if m and n are relatively prime, there are $n + 1$ points of intersection with the $n + 1$ vertical lines and $m + 1$ points of intersection with the $m + 1$ horizontal lines. Only the points A and C have been counted twice. Hence, in this case, the total number of points of intersection is $(m + 1) + (n + 1) - 2 = m + n$.

GCD $(4, 6) = 2$
∴ In the sub grid consisting of the first 2 rows and the first 3 columns, the number of points of intersection is 2 + 3 or 5. In the next sub grid (rows 3, 4 and columns 4, 5, 6) there are again 5 points but the first of these has already been counted.
∴ Total number of points of intersection is 5 + 5 − 1 or 9.   Choice (5)

Logical & Data Interpretation

41. As the first person can sit anywhere, let the first person sit in any one of the 'n' chairs so that the second person sits at a maximum distance.

1 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _

The 2nd person will then sit in the nth chair and the distance between the 2nd person and 1st person will be ($n - 2$).
Given $n = 17$

1 _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ 2

Now, every odd numbered person will have more than one choice and, depending on his position, the next even numbered person after him sits to the extreme end where there are minimum number of people.
Hence the arrangement becomes

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

This process continues in the same way.
The final arrangement looks as

1 3 5 7 _ _ _ _ _ _ _ _ _ _ 6 4 2

The sum of the distances of the 7th person from 1st to 6th persons is
$0 + 1 + 2 + 10 + 11 + 12 = 36$
∴ The maximum sum of distances of the 7th person = 36   Choice (3)

42. As observed in the previous problem the maximum sum of distances for every odd numbered person follows a constant pattern.

Let the number of chairs be n.

From above solution, the pattern for odd numbered persons will be
3rd person → $0 + (n - 3)$
5th person → $0 + 1 + (n - 5) + (n - 4)$
Similarly, for 9th person it will be
$0 + 1 + 2 + 3 + (n - 9) + (n - 8) + (n - 7) + (n - 6) = 4n - 24$
Given, $4n - 24 = 36 \Rightarrow n = 15$

Alternative solution:

Once we are confident that the answer is not "cannot be determined", (since there will be a pattern for odd numbered persons) we can easily eliminate options 1 and 3, since when compared to the earlier question, we are talking of the 9th person instead of the 7th person and the sum of distances, if $n \geq 17$, should only increase above 36. But given sum of distance = 36, n must be less than 17. An intelligent guess would be to choose $n = 15$, since $n = 13$ would be too less.   Choice (2)

43. We need to check for possible sequences of seating:

(1) ___1___ _ _ ___1___ _ _ _ ___1___ ___1___ (possible)
      3rd person   1st person   4th person 2nd person

(2) ___1___ ___1___ _ _ ___1___ _ _ _ ___1___ (possible)
      2nd person 4th person   1st person   3rd person

(3) ___1___ ___1___ _ _ _ _ _ ___1___ ___1___ (possible)
      1st person 3rd person   4th person 2nd person

(4) Not possible.   Choice (4)

44. As discussed in the earlier questions, every odd numbered person has more than one choice of seat.
Given $n = 13$

Case I :
Assume 1 is at the extreme end
1 _ _ _ _ _ _ _ _ _ _ _ _

Now the even numbered person has to sit to the end where there are minimum number of persons.
1 _ _ _ _ _ _ _ _ _ _ _ 2

The next odd numbered persons (i.e., 3rd) can sit in either end. Then the 4th person has to sit in the end where there are minimum number of persons.
1 3 _ _ _ _ _ _ _ _ _ 4 2

Similarly the process continues and the final arrangement is 1 3 5 7 _ _ _ _ _ 8 6 4 2

∴ Maximum sum of distances of 8th person is
$0 + 1 + 2 + 5 + 6 + 7 + 8 = 29$
Hence choice (1) is correct.

Case II :
Let us assume 1 is sitting in the middle of the row.
_ _ _ _ _ _ 1 _ _ _ _ _ _

The 2nd person can sit at either end of the row.
2 _ _ _ _ _ 1 _ _ _ _ _ _

The 3rd person has to sit in an end where there are minimum number of people.
2 _ _ _ _ _ 1 _ _ _ _ _ 3

The other persons follow the rule of sitting in a place such that the sum of distance is maximum.
The final arrangement is
2 4 6 8 _ _ 1 _ _ _ 7 5 3

The sum of distances of 8th person is
$0 + 1 + 2 + 2 + 6 + 7 + 8 = 26$
∴ Choice (3) is also correct.

Case III :
Let us assume 1 is sitting in 5th position from left.
_ _ _ _ 1 _ _ _ _ _ _ _ _

The 2nd person sits to the extreme end so that the distance is maximum from 1st person
_ _ _ _ 1 _ _ _ _ _ _ _ 2

Then the next person i.e., 3rd goes onto the extreme end where there are minimum number of persons.
3 _ _ _ 1 _ _ _ _ _ _ _ 2

Similarly the process continues and the final arrangement is 3 5 7 _ 1 _ _ _ _ 8 6 4 2

The maximum sum of distances of 8th person from 1 to 7 is $0 + 1 + 2 + 4 + 6 + 7 + 8 = 28$.
Hence choice (2) is also correct.

Case IV :
The only left out position for 1 is the 6th position from left.
_ _ _ _ _ 1 _ _ _ _ _ _ _

The process continues in the same way as it is done for the previous 3 cases. Hence the final arrangement is 3 5 7 _ _ 1 _ _ _ 8 6 4 2

∴ Sum of distances of 8th person is $0 + 1 + 2 + 3 + 6 + 7 + 8 = 27$
The other positions i.e., 8th from left would be the mirror image of 5th from left.
Hence option (4) is not a possible value for the sum of distances of 8th person from the 1st to 7th persons.

45. Option (1) discusses hearts transplant in general and does not say anything about natural or mechanical hearts.

Option (2) may sound good, but then a mechanical heart would need no strengthing.

Option (3) seriously weakens the given recommendation because the hormone required is not provided by any other source.

Option (4) is not discussing a flaw about mechanical heart. It ends up discussing the current lack of knowledge of some cardiologists. These cardiologists could always increase their knowledge of how mechanical pumps could be made to work efficiently.

Option (5) does not mean that the body rejects the transplant, and is therefore not the appropriate choice.   Choice (2)

46. The given para says that there should be a correlation between the performance by the player and the salaries paid if there is no discrimination. The conclusion is that certain clubs have achieved much less than what they could have by not recruiting black players – a clear evidence of discrimination. Such an attitude is seen in choice (2) – high wages paid to white players even though their performance is not as good as it should be to justify the wage. Option (3) can be ruled out since it is limited to 'the study period' and therefore the conclusion is specific not general. Option (5) would draw attention only if black players were better than white players.   Choice (2)

47. Fixed Deposits = 15% of their total savings
As it is given that this is half of Mr. Anand's savings, Mr. Anand's savings are 30% of their combined savings and the remaining 70% must be Mrs. Anand's savings.
∴ Ratio of their savings = 3 : 7

$\dfrac{5\% \text{ of income of Mr. Anand}}{21\% \text{ of income of Mrs. Anand}} = \dfrac{3}{7}$

∴ $\dfrac{\text{Income of Mr. Anand}}{\text{Income of Mrs. Anand}} = \dfrac{63}{35} = \dfrac{9}{5}$ Choice (4)

48. Given ratio of incomes is 3 : 1
⇒ Ratio of savings = 5 : 7
Let the total savings be Rs.12
Investments in PPF = 30% of total savings
⇒ 30% of 12 = 3.6
Required percentage = $\dfrac{3.6}{5} \times 20 = 72\%$ Choice (3)

49. Taxes constitute 18% of Mr. Anand's income and rate of tax is 30% beyond 1 lakh,
∴ 18% of income = 30% of (Income – one lakh)
⇒ 30000 = 12% of income
⇒ Income = Rs.2.5 lakh
Similarly, for Mrs. Anand
10% of income = 20% of (Income – one lakh)
⇒ 10% of income = 20000
⇒ Income = Rs.2 lakh
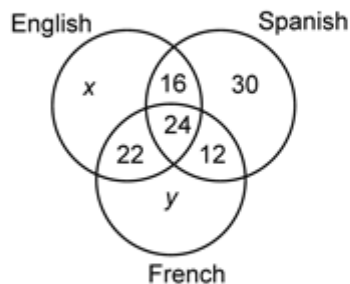∴ Ratio of earnings = 5 : 4.   Choice (2)

50. $\dfrac{12\% \text{ of income of Mr. Anand}}{25\% \text{ of income of Mrs. Anand}} = \dfrac{2}{5}$

∴ $\dfrac{\text{Income of Mrs. Anand}}{\text{Income of Mr. Anand}} = \dfrac{60}{50} = \dfrac{6}{5}$ Choice (5)

51. The given information can be represented in the form of Venn diagram.

Only English and French = English and French − all three
= 23% of 200 − 12% of 200
= 46 − 24 = 22

Similarly the remaining values can be found.

As $(x + 16 + 24 + 22) < (y + 22 + 24 + 12)$
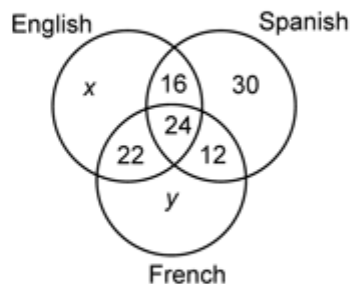$x + 4 < y$
Also, $x + y = 96 \Rightarrow x < 45$
$y > 51$
Required value is $51 + 12 + 30 = 93 = 46.5\%$ Choice (1)

52. The given information can be represented in the form of Venn diagram.

Only English and French = English and French − all three
= 23% of 200 − 12% of 200
= 46 − 24 = 22

Similarly the remaining values can be found.

As the number of people speaking Spanish, i.e., 82 is less than those speaking English, the number of people speaking English is at least 83, or those speaking English alone would be at least $83 − (16 + 24 + 22) = 21$.
People who speak French but not Spanish is at most
$200 − 21 + 16 + 30 + 24 + 12 = 97 = 48.5\%$.   Choice (2)

53. The given information can be represented in the form of Venn diagram.

Only English and French = English and French – all three
= 23% of 200 – 12% of 200
= 46 – 24 = 22
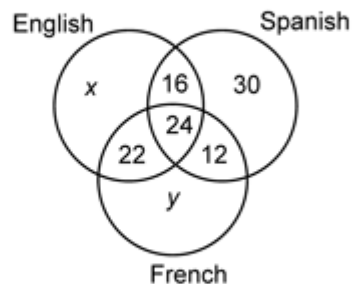
Similarly the remaining values can be found.

$62 + x = 2(58 + y)$
As $y = 96 – x$
$62 + x = 2(154 – x)$
$3x = 246 \quad \Rightarrow x = 82$
Required value = 93%   Choice (4)

54. The given information can be represented in the form of Venn diagram.

Only English and French = English and French – all three
= 23% of 200 – 12% of 200
= 46 – 24 = 22

Similarly the remaining values can be found.
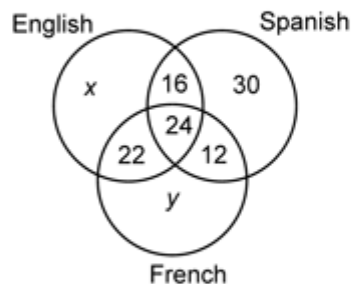
Given the number of people who speak French or Spanish is 144.
$\Rightarrow GT – a = 144$
$\Rightarrow a = 200 – 144 = 56$
Hence the number of people who speak English are 118.
∴ The required ratio is 82 : 118 = 41 : 59   Choice (1)

55. The only way in which Rohan can have the highest marks is if subjects A and D had maximum marks of 50.
∴ Ramu's scores = 40 + 68 + 56 + 46 + 76 = 286   Choice (2)

56. The possible maximum and minimum percentage marks that Ramu scored are

$80 + 34 + 28 + 92 + 76$ i.e., $\dfrac{310}{400} = 77.5\%$ and

$40 + 68 + 56 + 46 + 76$ i.e., $\dfrac{286}{400} = 71.5\%$

As the given percentage is 72, it means it closes to the lower end and so the maximum marks in Ramu's higher scoring subjects other than subject D is 50 and it can be seen that it is subject E.

Ramu's score = $80 + 68 + 56 + 46 + 38$ i.e., $\dfrac{288}{400} = 72\%$.   Choice (5)

57. Rakesh can have the highest total marks in more than one case when maximum marks of subject D and E are 50 or maximum marks of subjects C and E are 50 and so on.
∴ We cannot determine which subjects had a maximum marks of 50.   Choice (5)

58. The total number of goals scored (9, 7 and 5) are odd numbers resulting in a win. A draw is not possible in any match. The Winner must have won both its matches, the Runner-up would have won one match and the loser lost both its matches.
Total of goal differences in the tournament = Average × 3 = 3
3 ≡ (1 + 1 + 1) or (2 + 1 + 0)
'0' goal difference in a match not possible.
Hence, the three matches produced the following results:
Let the teams be L, M and N.

Match	Total goals	Winning team	Losing team
L & M	9	5	4
M & N	7	4	3
N & L	5	3	2

		Total goals	
	Winner	Loser	Runner-up
Case (i)	M : 5 + 4 = 9	6 = 4 + 2 : L	N : 3 + 3 = 6
Case (ii)	L : 5 + 3 = 8	5 = 3 + 2 : N	M : 4 + 4 = 8
Case (iii)	N : 4 + 3 = 7	4 → not possible	———————

Case (ii) is also eliminated because the total number of goals scored by the winner is 'distinctly' highest. In case (ii), L = M = 8
Runner-up scored a total of six goals.   Choice (3)

59. The 12th goal enabled one team to win over the other and hence it must be the last goal in that match.
It is possible to get a total of 12 goals in two matches if we assume that the two matches with 7 and 5 goals are the first two matches played, in either order.
Thus it was scored B (winner) over (Runner-up) OR by (Runner-up) over (the Loser) i.e., II or III only.   Choice (2)

60.

	Ashok	Akash	Akshay	Amar	Anoop
Cocktail	B	A	D/E	D/E	C
Drinks	Brandy + Gin	Whisky + Brandy			Rum + Vodka

Since A and E have a drink in common, it must be Whisky and Whisky can go with Rum or Gin. Since Amar does not take Whisky, E is taken by Akshay. Hence choice (3), i.e. Whisky + Gin is a possible cocktail of Akshay.   Choice (3)