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

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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.

What will remain in 100 years' time of the city or town where you were born: which landmarks or buildings? What about in 500 years? The controversial author Nassim Nicholas Taleb offers a counter-intuitive rule-of-thumb for answering questions like this. If you want to know how long something non-perishable will endure [....] then the first question you should ask is how long it has already existed. The older it is, the more likely it is to go on surviving.

The logic of Taleb's argument is simple. Because the only judge that matters when it comes to the future is time, our only genuinely reliable technique for looking ahead is to ask what has already proved enduring...

Taleb's preferred name for this line of reasoning is the Lindy Effect, for impeccably eccentric historical reasons. In June 1964, the American author Albert Goldman published an article titled "Lindy's Law" in The New Republic magazine in which he presented the "cautionary fable" of showbiz conversations in Lindy's delicatessen in New York. ... [I]n-the-know comedians gathered [here] to discuss the likely staying power of their peers. If someone [used] up their material in a short burst of activity, the reasoning went, their career would soon be over. But if they [made] fewer but higher-impact appearances, this conservation of resources might see them endure for decades in the industry.

Taleb has extended this anecdotal insight considerably. "Things that have been around for a long time are not 'aging' like persons, but 'aging' in reverse," he writes in his 2012 book *Antifragile*. "Every year that passes without extinction doubles the additional life expectancy." ...

Consider London's buildings. ... They are subject to the same forces of wear and tear as everything else on Earth: they may be tough, but they cannot remain in good condition without human support. ... The longer something has endured, the more significance and symbolic meaning it has accrued – and the more tests of function and fashion it has passed. ...Over the centuries, fortune and favour have fixed them into the city's identity.

The force of the Lindy effect – and the relationship between architecture and culture – can also be seen in the efforts of those who wish to eliminate something old. In the name of efficiency and anti-idolatry, Saudi Arabia has, over the last few decades, destroyed vast amounts of its ancient heritage, aiming to accommodate... the ultraconservative Wahhabi ideology of its rulers. Much of the country's culture and heritage are treated as a threat to this ideology, perhaps because those things that have lasted for centuries may engender more complex and enduring loyalties than absolute rulers are comfortable with. ... The Lindy effect marks a deep threat and affront to those who wish to sweep away the complexities and intransigence of our relationship with the past

....

At this point, fitness in the evolutionary sense – that which has proved its worth and adaptability by surviving – may seem to be in conflict with one of the basic principles of reasoned argument. If you cannot give good reasons for something, it is not reasonable to believe it: and saying "things have been like this for a long time" is surely not a good reason to keep on doing something. Yet this is only a problem if we confuse "good" reasons in the sense of strong reasons with "good" reasons in the sense of praiseworthy or ethically desirable ones. ...

1. The similarity between the Lindy effect, as proposed by Taleb, and the Lindy's Law, as described by Goldman, is that both
   (A) discuss the importance of conservation of resources for endurance sake.
   (B) emphasise that the age of something is a good indicator of its longevity.
   (C) try to predict the life expectancy of something based on its history.
   (D) talk about the benefits of enduring over a long period of time.

2. "[T]he relationship between architecture and culture", mentioned in the penultimate para of the passage, best manifests itself in which of the following statements, taken from the passage?
   (A) "*Over the centuries, fortune and favour have fixed [the buildings] into the city's identity.*"
   (B) "*The longer something has endured, the more significance and symbolic meaning it has accrued*".
   (C) "*[The buildings] may be tough, but they cannot remain in good condition without human support.*"
   (D) "*Every year that passes without extinction doubles the additional life expectancy.*"

3. Which of the following, if true, is the best example of "aging in reverse" as mentioned in the passage?
   (A) The life expectancy of certain tortoises doubles for every additional year of its survival.
   (B) The longer a book has been in print, the greater the number of copies it would have sold.
   (C) A company which was established a year earlier than another company is twice as likely to survive.
   (D) With each additional year of survival, the time for which an ideology can further endure doubles.

4. The author provides the example of Saudi Arabia to
   (A) highlight the conflict between the loyalty to the rulers and the loyalty to cultural artefacts.
   (B) provide a real-world example of how the Lindy effect negatively impacts cultural artefacts.
   (C) emphasise the threat that the Lindy effect represents to autocratic rulers.
   (D) establish the complex relation between architecture and ideology.

5. Which of the following can be inferred about the reason that "things have been like this for a long time", to keep on doing something?
   (A) It can be a "good" reason, if we consider "good" to mean strong.
   (B) It can be a strong reason, which is often confused with being a praiseworthy reason.
   (C) It can be an ethically desirable reason but it is often confused with being a strong reason.
   (D) It can be a laudable and ethically desirable reason.

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.

Political scientists, like other social and natural scientists, gather data and formulate theories. The two tasks are often out of balance, however, leading either to the collection of irrelevant facts or to the construction of misleading theories. Throughout the post-World War II era, political scientists developed and discarded numerous theories, and there was considerable (and unresolved) debate as to whether it is more important to develop theories and then collect data to confirm or reject them or to collect and analyze data from which theories would flow...

Prior to the development of reliable survey research, most political analyses focused on elites. Once a sizable amount of research had become available, there was a considerable debate about whether rulers are guided by citizen preferences, expressed through interest groups and elections, or whether elites pursue their own goals and manipulate public opinion to achieve their ends. Despite numerous studies of public opinion, voting behaviour, and interest groups, the issue [remains] unresolvable. Analyses can establish statistical relationships, but it has been difficult to demonstrate causality with any certainty. This debate is complicated by two factors. First, although there is a considerable body of survey and electoral data, most people ignore politics most of the time, a factor that must be considered in attempting to understand which part of the "public" policymakers listen to – all citizens, all voters, or only those expressing an intense view on a particular matter. Political analyses based on elites are hindered by a dearth of reliable elite-level data, as researchers are rarely invited into the deliberations of rulers. Accordingly, much is known about the social bases of politics but little of how and why decisions are made. Even when decision-makers grant interviews or write their memoirs, firm conclusions remain elusive, because officials often provide accounts that are self-serving or misleading.

Political science has had difficulty handling rapid change; it prefers the static (stable political systems) to the dynamic. If historians are stuck in the past, political scientists are often captives of the present. For some, the collapse of the Soviet Union showed that the theories and methods of political science are of only limited utility. Despite decades of gathering data and theorizing, political science was unable to anticipate the defining event of the post-World War II era. Critics charged that political science could describe what is but could never discern what was likely to be. Others, however, maintained that this criticism was unfair, arguing that such upheavals can be predicted, given sufficient data...

At the beginning of the 21st century, political science was faced with a stark dilemma: the more scientific it tried to be, the more removed it found itself from the burning issues of the day. Although some research in political science would continue to be arcane and unintelligible to the layperson and even to other scholars, many political scientists attempted to steer a middle course, one that maintained a rigorous scientific approach but also addressed questions that are important to academics, citizens, and decision makers alike. Indeed, some political scientists, recognizing that many "scientific" approaches had lost their utility after a decade or two, suggested that the discipline should cease its attempts to imitate the natural sciences and return to the classic concerns of analysing and promoting the political good.

6. Political analyses involving elites is hampered by
   (A) the lack of a sizable amount of electoral data.
   (B) the exclusion of analysts from the discussions of the elites.
   (C) the misleading accounts provided by those who grant interviews.
   (D) the interest-driven approach of elites to serve their own interests.

7. The author believes that political scientists are "captives of the present" because political scientists
   (A) struggle to adapt to swift changes.
   (B) take time to come to terms with the rapidity of changes in political systems.
   (C) are dynamic and live in the present.
   (D) fail to anticipate defining events.

8. Which of the following statements, if true, will weaken the criticism against political scientists in the post-World War II era?
   (A) The data gathered by political scientists could not really account for the political and cultural volatility of the Soviet Union.
   (B) World events unravel at a much more rapid pace than political scientists are comfortable dealing with.
   (C) Given sufficient data that encompasses political patterns, political scientists can make predictions about political events.
   (D) Political science was less of a science and more of a way to push the agenda of political good.

9. The dilemma faced by political science at the beginning of the 21st century is that
   (A) it is impossible to walk the tightrope between being scientific and being relevant to policymakers.
   (B) a rigorous scientific approach could steer political scientists away from addressing questions relevant to contemporary events.
   (C) some of the research in political science is obsolete and difficult to comprehend.
   (D) a focus on science stops researchers from focusing on doing political good.

10. Which of the following studies can be helpful to ascertain the nature of work that political scientists should take up?
   (A) A study that collates information about strong public opinions and voting behaviour of all citizens.
   (B) A study that analyses the accuracy of information provided by the decision-makers in interviews and personal memoirs.
   (C) A study that analyses the duration for which a scientific method stays relevant.
   (D) A study of the best practices of scientific approach which could address the analysis of contemporary events.

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.

Streaming is the most popular way people listen to music, but old formats like cassettes and vinyl have both seen an increase in sales in recent years...[T]his means that more non-recyclable discs will be manufactured – which could have a negative impact on the environment.

...[Records] were originally made of shellac, before non-recyclable vinyl was used as a replacement. Shellac is a natural resin ... scraped from trees to produce gramophone records. Since shellac isn't derived from fossil fuels, its carbon footprint was lower than that of modern records.

Shellac records were brittle and prone to damage from water and alcohol; so, PVC plastic records were developed as a more durable alternative. In ideal conditions, ... discarded PVC is likely to take centuries to decompose. The environmental conditions of most landfill sites can cause discarded PVC albums to leach plasticisers (solvents added to plastics to make them more flexible and resilient). They may even outlive the site itself or escape into the environment as pollutants.

...In the 80s, records were replaced by CDs ... made of layered polycarbonate and aluminium, which has slightly less environmental impact than PVC... However, CDs can't be recycled because they're made of mixed materials, which are difficult and uneconomical to separate into their component parts for recycling. CDs were also encased in fragile polycarbonate cases, which, despite being a single material, aren't widely recycled, [and] scratched and damaged disks often ended up in landfills.

... [Low-quality, cheap CDs] were easily damaged by direct exposure to sunlight and heat, warped by fast-changing temperatures, gravity, scratches, fingerprints and smudges – subsequently resulting in them getting thrown out.

Current digital technology, however, gives us flawless music quality without physical deterioration. Music is easy to copy and upload, and can be streamed online without downloading. Since our digital music is less tangible than vinyl or CDs, surely it must be more environmentally friendly?

Even though new formats are material-free, that doesn't mean they don't have an environmental impact. The electronic files we download are stored on active, cooled servers. The information is then retrieved and transmitted across the network to a router, which is transferred by wi-fi to our electronic devices. This happens every time we stream a track, which costs energy...

So, which is the greener option? It depends on many things, including how many times you listen to your music...If you listen repeatedly, a physical copy is best – streaming an album over the internet more than 27 times will likely use more energy than it takes to produce and manufacture a CD. If you want to reduce your impact on the environment, then

vintage vinyl could be a great physical option. For online music, local storage on phones, computers or local network drives ... will reduce the need for streaming over distance from remote severs across a power-hungry network.

In a world where more and more of our economy and social relations happen online, records, and other vintage music formats, buck that trend. Instead, the record revival shows us [that] ... older music formats [endure because] they have a sense of importance and permanence attached to them. It seems that whatever the format, owning copies of our favourite and most treasured music, and playing them over and over again, might just be the best option for our environment.

11. Cassettes and vinyl are making a comeback, according to the author, because:
(A) they are far more reliable than CDs.
(B) their transient nature makes them attractive to possess.
(C) vintage formats have a sense of importance and permanence.
(D) owning copies of music and playing them over and over again is the right thing to do.

12. All of the following are true about the negative environmental impact of CDs EXCEPT that:
(A) CDs are encased in fragile polycarbonate cases which are not recycled.
(B) CDs are easily damaged due to light and heat reducing the utility of CDs.
(C) it is not economically feasible to recycle CDs because of their mixed components.
(D) the materials used in CDs have a greater environmental impact than PVC does.

13. Which of the following statements, if true, will most strengthen the author's central argument?
(A) The cost of recycling CDs and their cases will pay for itself in a short time.
(B) Studies have shown that many music listeners do not listen to many of their tracks more than 27 times.
(C) People collect vinyl because they prefer physical copies to digital copies.
(D) Surveys have shown that music listeners often stream the same music hundreds of times.

14. The shift from shellac to PVC indicates that:
(A) record-makers were more concerned about durability than about decomposability of the material.
(B) environmental awareness was poor until the 80s.
(C) the ill-effects of plastic weren't really known until CDs began to be manufactured.
(D) natural resins are not ideal for goods that are produced for longevity.

15. In believing that records and vintage music formats 'buck that trend' (last para), the author assumes that:
(A) increased sales of records are a good indicator of decreasing music streaming.
(B) people buy records as an alternative to their digital music.
(C) digital music doesn't give people a sense of permanence.
(D) those who consume music have become more environmentally aware.

DIRECTIONS *for questions 16 to 19:* The passage given below is accompanied by a set of four questions. Choose the best answer to each question.

The US and the world are engaged in a great debate about new trade agreements. Such pacts used to be called free-trade agreements; in fact, they were managed trade agreements, tailored to corporate interests, largely in the US and the EU. Today, such deals are more often referred to as partnerships, as in the Trans-Pacific Partnership (TPP). But they are not partnerships of equals: the US effectively dictates the terms. Fortunately, America's "partners" are becoming increasingly resistant.

It is not hard to see why. These agreements go well beyond trade, governing investment and intellectual property as well, imposing fundamental changes to countries' legal, judicial, and regulatory frameworks, without input or accountability through democratic institutions.

Perhaps the most invidious part of such agreements concerns investor protection. Of course, investors have to be protected against rogue governments seizing their property. But that is not what these provisions are about. There have been very few expropriations in recent decades, and investors who want to protect themselves can buy insurance from the Multilateral Investment Guarantee Agency, a World Bank affiliate, and the US and other governments provide similar insurance. Nonetheless, the US is demanding such provisions in the TPP, even though many of its partners have property protections and judicial systems that are as good as its own. The real intent of these provisions is to impede health, environmental, safety, and, yes, even financial regulations meant to protect America's own economy and citizens. Companies can sue governments for full compensation for any reduction in their future-expected profits resulting from regulatory changes.

This is not just a theoretical possibility. Philip Morris is suing Uruguay and Australia for requiring warning labels on cigarettes [and] mandating the inclusion of graphic images showing the consequences of cigarette smoking. The labelling is working. It is discouraging smoking. So now Philip Morris is demanding to be compensated for lost profits.

In the future, if we discover that some other product causes health problems (think of asbestos), rather than facing lawsuits for the costs imposed on us, the manufacturer could sue governments for restraining them from killing more people. The same thing could happen if our governments impose more stringent regulations to protect us from the impact of greenhouse gas emissions.

... And, though corporations can bring suit, others cannot. If there is a violation of other commitments – on labour and environmental standards, for example – citizens, unions, and civil society groups have no recourse. If there ever was a one-sided dispute-resolution mechanism that violates basic principles, this is it...American supporters of such agreements point out that the US has been sued only a few times so far and has not lost a case. Corporations, however, are just learning how to use these agreements to their advantage. And high-priced corporate lawyers in the US, Europe and Japan will likely outmatch the underpaid government lawyers attempting to defend the public interest. Worse still, corporations in advanced countries can create subsidiaries in member countries through which to invest back home, and then sue, giving them a new channel to block regulations...

Rules and regulations determine the kind of economy and society in which people live...The question is whether we should allow rich corporations to use provisions hidden in so-called trade agreements to dictate how we will live in the 21st century...

16. Which of the following is not a reason that the author doesn't favour provisions for investor protection in trade agreements?
(A) Insurance is available to investors from Multilateral Investment Guarantee Agency.
(B) The US and several other countries offer mechanisms and safeguards to shield investments.
(C) Cases of rogue governments seizing investor property have been few and far in between.
(D) The provisions safeguard the health, safety, and financial regulations of the US despite these being a partnership of equals.

17. The author calls the dispute-resolution mechanism one-sided because
(A) America has been sued only a few times and has not lost a case.
(B) While corporations can sue governments, the former can get away despite violation of commitment.
(C) Governments cannot bring about regulations to protect the environment from greenhouse gas emissions.
(D) Manufacturers of products that cause health problems can sue the government instead of paying penalties for the harm they cause.

18. Which of the following is not a warning mentioned by the author to show that provisions for investor protection will be abused?
(A) Corporations haven't yet figured out completely how to use the provisions to their advantage.
(B) Corporations can invest in their home country through foreign holdings to circumvent regulations and benefit from investor protection.
(C) Corporations have a greater chance of winning cases in the future thanks to the heft of highly paid lawyers working for them.
(D) Corporations have understood how to use the agreements to their benefit.

19. Which of the following inferences can most reasonably be drawn from the data and arguments provided by the author in the passage?
(A) Pay given to lawyers is a parameter to determine the legal wherewithal of a corporation or government.
(B) Corporations are driven by profits more than concern for environment and public health.
(C) Trade agreements are designed purely to bypass the stringent regulatory framework within a country.
(D) The US government is inclined more towards corporate interests than towards its social responsibilities.

DIRECTIONS *for questions 20 to 24:* The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

Fewer Africans are dying from malaria but the estimated number of cases has barely changed since 2011. Ten African countries and India account for 70% of global cases. Numbers in India are falling, but not in the worst-afflicted African countries. Some places, such as Zambia, are trying hard to tackle the disease. It was the first African country to use artemisinin-based combination therapies (ACTS), the recommended treatment. Some 70% of Zambians have access to treated bed nets or indoor sprays. Zambia's government works well with foreign groups such as the JC Flowers Foundation, which funds efforts at border villages like Mwanga. Reported deaths fell from 9,369 in 2001 to fewer than 1,425 in 2017. But the number of cases – 3.5m a year – has barely budged since 2014. Zambia has pledged to become the first sub-Saharan African country to eliminate malaria by 2021. ...

Malaria is proving resilient. One reason may be the declining share of families that use anti-mosquito sprays. Another may be resistance to the insecticides used in bed nets or sprays. African countries ridden with poverty also have shoddy public -health systems, especially in war zones such as northern Nigeria. Such places are typically not equipped to cope with new treatment-resistant strains of the disease. [Variants] resistant to chloroquine, a past treatment, have travelled around the world. And South-East Asia, where those variants appeared, is again suffering local outbreaks incurable by ACTS ...

Two types of malaria parasite most trouble the Greater Mekong Region. *Plasmodium falciparum* kills the most people globally. *Plasmodium vivax* [which is less deadly] is to blame for many malarial cases outside sub-Saharan Africa. Malaria parasites mutate to survive. In parts of the Mekong, the parasites Anopheles mosquitoes inject into the human bloodstream are dangerously resisting conventional treatment. ...

ACTS work in two main ways. The artemisinin lowers parasite levels in the body within about three days. A partner drug then works to clear them entirely. Resistance can develop to both artemisinin and the partner – and both are failing in Cambodia, Thailand, Laos, Vietnam, and Myanmar. The Mekong seems to spawn resistance to ACTS – its tropical

climate, forests and rubber plantations are responsible. ... In the Mekong, malaria often affects young workers engaged in dodgy practices such as illegal logging. Many fail to seek help quickly or victims often stop taking long courses of medication too soon. Others turn to traditional healers before coming to clinics.

A prophylactic programme needs both to reduce the number of people bitten by infected mosquitoes and to shorten the time before infected people seek treatment. This requires adequate funding for rural health-care services and outreach programmes. Low-cost, rapid diagnostic tests remain one of the most important tools and coordinated government efforts make a big difference.

Without political commitment and the cash to match, the world risks a relapse in the fight against malaria. Such backsliding occurred in the 1960s, squandering the progress in the preceding decade against the disease in many countries, including India and Pakistan. The hope is that this time success breeds greater commitment rather than greater complacency. Donors, drug firms and governments of rich countries are all working on multi-drug-resistant malaria. A new pill to treat *P. vivax* infections, Tafe[illegible], may soon be available. Any fresh breakthrough in new anti-malarial drugs should not only be supported by governments worldwide but also by privately funded agencies. This is where the Global Fund and JC Flowers Foundation could step in.

Scientists have been struggling for decades to produce a really effective vaccine. The battle to vanquish malaria remains extremely long and arduous.

20. When the author points to the "backsliding that occurred in the 1960s" (penultimate para), he opines that
(A) the malaria malady has staged a dramatic comeback after its near-eradication in the early and mid-1950s.
(B) there will be a welcome change from earlier times in the overall strategy for eradicating malaria.
(C) progress made in fighting malaria before the 1960s was impeded by greater complacency in the 1960s.
(D) as malaria mutates to survive, its elimination is proving difficult.

21. Which of the following can be understood from the passage?
a. The term 'prophylactic programme' can be best substituted by the phrase 'programme that is associated with treatment of malaria'.
b. The JC Flowers Foundation should focus more on research activities pertaining to malaria eradication.
c. Shoddy public health systems are one of the reasons that have contributed to the spread of malaria.
d. In Africa, malaria cases are as frequent as ever and in South-East Asia, drug-resistant strains are appearing.
(A) b and c (B) c and d
(C) Only a (D) a, c and d

22. The author has primarily provided the example of the Greater Mekong Region in the passage to
(A) cite the two types of malaria parasites causing havoc there.
(B) discuss the sophisticated technologies it has developed to diagnose multi-drug-resistant malaria.
(C) explain that its tropical climate, forests, rubber plantations and people behaviour have proved beneficial in successfully combating malaria.
(D) highlight increasing resistance of the malarial parasites made possible by certain environmental features and local practices.

23. According to the author, Zambia
(A) is on its way to becoming the first sub-Saharan African country to eliminate malaria.
(B) has been declared malaria free by the WHO.
(C) has reduced the fatalities resulting from malaria but not the frequency of its occurrence.
(D) is the only African nation that adequately funds rural health-care services and outreach programmes.

24. Which of the following is the primary concern of the author in the passage?
(A) To challenge the validity of a therapy by exposing the inconsistencies and contradictions in it.
(B) To discuss several challenges in the quest to eliminate a particular problem.
(C) To support an alternative to an accepted methodology in treating malaria.
(D) To explain reasons for the limitations of both traditional and newer methods of fighting malaria.

DIRECTIONS *for question 25*: Five sentences related to a topic are given in the question below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

25. (1) With bionic boots we get past the limiting factors of the spaghetti strap we call the Achilles' Heel.
(2) Determined as he was to unlock the secret to their quickness, he eventually came up with a solution: super boots that (literally) add a spring to your step, increasing your force and speed.
(3) His company Bionic Boot hopes to someday add pistons to their top grade aluminum and carbon fiber boots to help humans reach speeds of up to 45 mph.
(4) Ever since he was a teenager, Keahi Seymour has admired the incredible speeds of the ostrich (up to 45 mph) and other land-dwelling two-legged creatures.
(5) Many years and a dozen prototypes later, Seymour's latest version of his "bionic boot" has springs on the back emulating the achilles tendons of an ostrich or a kangaroo, and boosts a man's pace to a brisk 25 mph.

DIRECTIONS *for question 26*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

26. (1) It's a map of galaxies, which are coloured according to their distance from us – the purple bits are closest, the red farthest away – and they are all in what astronomers, with their vertiginous sense of scale, call the "local universe" that stretches for 380m light years.
(2) We are all familiar with maps of the globe, as though seen from space, unfolded onto a flat page with America on the left and China on the right.
(3) But unlike those two-dimensional maps, this one allows us to see in three dimensions: up and down, left and right, and then out through the universe.
(4) A new map, with a glowing web of blobs and veins like so many city lights at night, shows space seen from Earth similarly unfolded.

DIRECTIONS *for question 27*: The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.

27. The deep connection between literature and suffering suggests that imaginary societies designed for secular happiness will have rather little appeal as a literary subject. Utopia, in other words, will never become a central literary genre because the very premise of a world in which happiness is the norm threatens to remove the very thing that makes literature engaging. Even comedy, to be effective, dwells upon difficulty and confusion — until the happy ending hustles the lucky characters offstage before their blessings have a chance to cloy. As agents, we may aim at happiness, and utopia charms as an idea, but as spectators we prefer struggle and pain. This raises the suspicion that our affinity for happiness is strictly limited, and that many of us are dystopians at heart, most deeply at home in what Conrad called "the destructive element."
(A) Literature leans towards suffering and, hence, away from utopian concepts, making us wonder whether it reflects the limitations of humanity's inclination for happiness.
(B) Humans have a predilection for tragedy and that reflects in our literature, which generally drifts away from utopian ideas.
(C) It is our innate nature to seek happiness from tragedy and that makes utopian subjects incompatible to literature.
(D) Literature's inherent connection to suffering makes it impossible for utopias to be appealing, a glitch that comedies bypass by being centred around negative situations.

DIRECTIONS *for question 28*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

28. (1) Russia and Greece are major examples of 'individual loyalties' being informed less by impersonal discourses and more by fluid, shifting, and often locally based cleavages.
(2) The nature of civil wars prescribes the pervasive involvement of average people, but many have questioned the actual existence of widespread popular support in 'old' wars for the ideological battle.
(3) They formed the basis for the majority of the tacit support given to all sides and as a result allow us to question the 'civil' qualities of these 'civil' wars.
(4) By considering the micro-level concerns of the peasant populations of Greece and Russia, it can be seen that these divisions had far more to do with economics than with ideology or nationalism.

DIRECTIONS *for question 29*: Five sentences related to a topic are given in the question below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

29. (1) A 2013 poll found that Britons thought 24% of the population was Muslim – almost five times the correct figure of 5%.
(2) If public misperceptions can distort economic debate, they are also a problem when it comes to financial markets.
(3) The polling company Ipsos Mori found that Americans think 33% of the population are immigrants, for example, when the actual number is 14%.
(4) On many issues, the gap between public perceptions and reality is very wide.
(5) It is not the "unknown unknowns" that catch people out, but the truths they hold to be self-evident that turn out to be completely wrong.

DIRECTIONS *for question* 30: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

30. (1) Whiteflies can trick the plant into behaving as if it was threatened with a disease rather than an insect infestation and the plants produce more salicylic acid and less insect-repelling jasmonic acid, making it much easier for them to infest the plant.
(2) This hormone triggers the production of compounds that interfere with the fly's digestive enzymes, making it difficult for it to feed.
(3) When flies launch an attack, plants usually respond by producing jasmonic acid as a defence mechanism.
(4) But plants also can produce a different substance, salicylic acid, to help ward off pathogens, such as a virus.

DIRECTIONS *for question 31*: The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.

31. Natural competition is wildly expedient in its moment-to-moment interaction. But it is inherently conservative in the way it changes a species' characteristic behaviour. By contrast, strategic competition is deliberate, carefully considered, and tightly reasoned. But the consequences may well be a radical change in a relatively short period of time. Natural competition is evolutionary. Strategic competition is revolutionary. Natural competition works by a process of low-risk, incremental trial and error. Small changes are tried and tested. Those that are beneficial are gradually adopted and maintained. No need for foresight or commitment, what matters is adaptation to the way things are now. Natural competition can and does evolve exquisitely complex and effective forms eventually. Humans are just such an end result. But unmanaged change takes thousands of generations. Often it cannot keep up with a fast-changing environment and with the adaptation of competitors.

(A) Natural competition entails slow, but, certain evolution, while strategic competition entails rapid change, that may or may not be beneficial in the long run.

(B) Natural competition gradually builds a stronger system, albeit at a slower rate, compared to strategic competition which renovates the system to suit the needs of the environment.

(C) Natural competition is conservative and careful, and works best for complex systems, while strategic competition is radical and reckless, and ideal for nimble systems.

(D) Natural competition works on trial and error and incremental changes that slowly help the system evolve, while strategic competition is more suited to a fast-changing environment because of its logically compact but radical changes.

DIRECTIONS *for question* 32: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

32. (1) What looks like a failure is often just the beginning of something else, often something more interesting.

(2) The fear from our market-driven culture is that the piece never comes to fruition and "fails."

(3) So, what's the worst that could happen if individuals and institutions started funding the roughest sketches of an artist's idea?

(4) However, we have seen great examples of this in very public forums.

DIRECTIONS *for question 33*: The paragraph given below is followed by four summaries. Choose the option that best captures the essence of the text.

33. Different artists are inspired by different objects; what is attractive and stimulating to one is depressing and unattractive to another, and the choice also varies from race to race and epoch to epoch. As to the appreciation of such works, it is the same; for men in general admire only such works as by education or temperament they are predisposed to admire. The classic scholar starts convinced that the art of Greece has never been equalled or surpassed, and never will be; there are many who think, like Michelangelo, that because Italian painting is good, therefore good painting is Italian. There are many who have never yet felt the beauty of Egyptian sculpture or Chinese or Indian painting or music: that they have also the hardihood to deny their beauty, however, proves nothing. The eighteenth century had forgotten the beauty of Gothic sculpture and primitive Italian painting, and the memory of their beauty was only restored by a great effort in the course of the nineteenth. The western appreciation of desert and mountain scenery is also no older than the nineteenth century and artists of the highest rank are often not understood till long after their death.

(A) Art is a reflection of humanity, and humanity's greatest virtue is the ability to achieve the highest state of absolute beauty in works of art.

(B) The more we consider the variety of human determination seen in works of art, the more we must admit the relativity of taste. A true art critic is able to distinguish works of genuine art from those that are not beautiful.

(C) There exists no absolute standard when it comes to appreciating an artwork. That certain works are beautiful can be forgotten or understood only after a very long time.

(D) Everyone chooses his love out of the objects of beauty according to his own taste. That which seems to be beautiful to one is described as ugly by another.

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

34. (1) You don't want to make the utilitarian principle 'Sacrifice others for the greater good' a Kantian universal principle, as someone might want to sacrifice you for some greater good.

(2) The 2018 movie Avengers: Infinity War contrasts these two philosophies. Captain America, the heroes' leader, takes up the Kantian position, and Thanos, the villain, takes up the utilitarian position.

(3) Immanuel Kant argued that every human being is an 'end in themselves': a basic moral unit who is due basic moral consideration and should never be used merely as a means to other ends.

(4) So, this is why people wouldn't usually want to harvest someone's organs.

(5) Kant also said that you should act only in such a way that you would be willing to make the principle of your action a universal principle for all moral beings.

SECTION – II
Number of Questions = 32

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

Six teams, A through F, participated in a round robin tournament, in which each team played against each of the other teams exactly once. The tournament was conducted across five days, such that each team played exactly one match on each day.

Each match ended as a win or a loss or a draw. The table below provides information on the results of the matches played by each team. The results for each team are given, from left to right, in the order in which the team played its matches. A 'W' indicates a win; an 'L' indicates a loss and a 'D' indicates a draw.

Team	Results
A	WDLWD
B	LLWLW
C	LWDDD
D	WDLDL
E	LWDWD
F	WLWLD

DIRECTIONS *for questions 1 to 4:* Select the correct alternative from the given choices.

1. Which of the following teams did A play against on the first day of the tournament?
   (A) B
   (B) E
   (C) C
   (D) Cannot be determined

2. How many matches did B lose before it played against E?
   (A) 3 (B) 2 (C) 1 (D) 0

3. How many teams did not lose any match before they played against A?
   (A) 2
   (B) 1
   (C) 0
   (D) None of the above

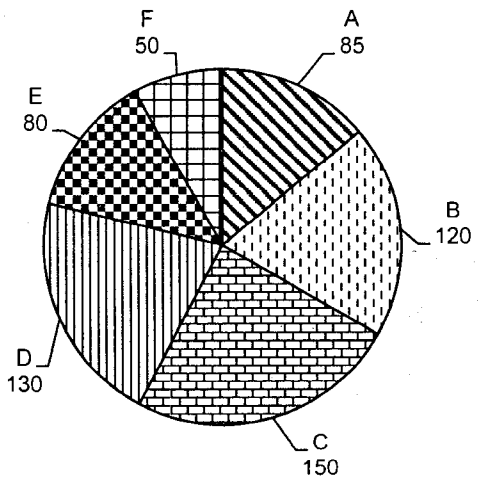
4. If any team that won against A, B, C, D, E and F were awarded 1, 2, 3, 4, 5 and 6 points, respectively, and no points were awarded in any other manner, how many teams would have been awarded more than 5 points in the tournament?
   (A) 2 (B) 3 (C) 4 (D) 1

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

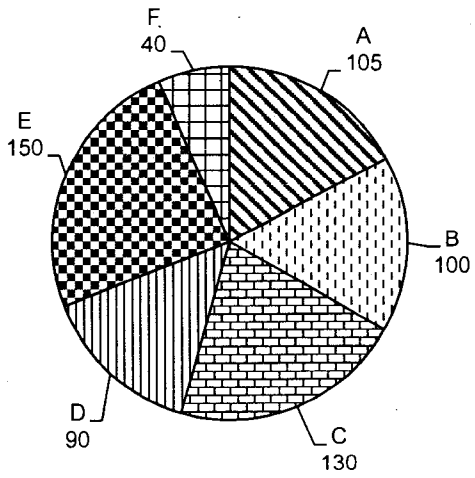
Six countries, A through F, exported and imported steel only among themselves. Any country can both export and import steel. However, no country can export to any country from which it imports and vice versa.

The following pie charts provide the quantity of steel exported and imported by each of the six countries during a particular year:

Steel Exported (in mn tonnes)



Steel Imported (in mn tonnes)



DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.

5. If one of the six countries, say X, exported only to D and another country, say Y, imported only from D, how many distinct possibilities exist for the pair (X, Y)?
(A) 10 (B) 12 (C) 14 (D) 15

6. It is known that, each of C, D and E, imported from exactly two countries and exported to exactly two countries. Further, each of C, D and E imported an equal quantity of steel from each country from which it imported steel and exported an equal quantity of steel to each country to which it exported steel.

To which of the following countries did C export steel?
(A) A (B) B (C) D (D) F

7. It is known that, each of C, D and E, imported from exactly two countries and exported to exactly two countries. Further, each of C, D and E imported an equal quantity of steel from each country from which it imported steel and exported an equal quantity of steel to each country to which it exported steel.

What is the quantity of steel (in mn tonnes) that A exported to B?
(A) 10
(B) 20
(C) 30
(D) A did not export to B.

8. It is known that, each of C, D and E, imported from exactly two countries and exported to exactly two countries. Further, each of C, D and E imported an equal quantity of steel from each country from which it imported steel and exported an equal quantity of steel to each country to which it exported steel.

From which of the following countries did B not import steel?
(A) D
(B) C
(C) F
(D) More than one of the above

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

Five persons, A through E, were standing along a straight line from East to West, not necessarily in the same order. The five persons were facing four different directions, North, South, East and West. The distance between any pair of persons standing immediately next to each other was exactly 10 m. After some time, the five of them walked exactly 10 m along the direction that they were facing.

The following information is known about the distances between them before and after they walked for 10 m:

(i) After walking, the distance between A and B was exactly 10 m.
(ii) D, who was facing East, was at a distance of exactly 10 m from both B and E, after walking.
(iii) No two persons were at the same point after walking.
(iv) Before they started walking, B was to the West of E and they were neither facing the same direction nor facing each other.
(v) At least one person was facing North and at least one person was facing West.
(vi) The distance between E and C decreased after walking but the distance between A and C remained the same.

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

9. What is the distance between B and C after walking?
(A) 10 m (B) 20 m
(C) $10\sqrt{2}$ m (D) $20\sqrt{2}$ m

10. Who among the following was standing the closest to A after walking?
(A) D
(B) E
(C) C
(D) More than one of the above

11. If all of them walked a further 10 m along the respective directions that they were facing, what will be the distance between A and D?
(A) 10 m (B) $20\sqrt{2}$ m
(C) 20 m (D) $20\sqrt{5}$ m

12. If all of them walked a further 10 m along the direction that they were facing, the distance between which of the following pairs of persons will be the highest?
(A) A and C (B) A and D
(C) C and E (D) C and D

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

Three buses – B123, B345 and B456 – travel between six different stops – A through F. These stops are connected by roads as indicated in the figure below. Each of the three buses travels indefinitely along a different route among the three routes, A – B – C – D – E – F – A, F – E – D – C – B – A – F and B – E – D – C – F – A – B, not necessarily in the same order. Further, any bus while travelling from one stop to the next does not pass through any other stop.

The fare of each bus between any two stops is calculated as the product of the distance between the two stops and a per kilometre fare, which is distinct for the three buses. The distance in kilometres between any two stops is a natural number and the per kilometre fare (in ₹) is a natural number greater than 2.

On a particular day, ten persons travelled in the three buses. The table below provides, for each of the ten persons, the bus that he travelled on, the stop where he boarded the bus and the stop where he got off the bus and the fare paid by him. It is known that no person travelled through the same stop twice.

Person	Bus	From	To	Fare (in ₹)
Ram	B123	A	D	42
Tej	B456	D	F	32
Uday	B123	B	E	54
Nitin	B345	B	C	90
Paul	B345	C	B	36
Jai	B123	B	D	36
Sudeep	B456	C	E	24
Lohit	B345	E	C	63
Parvesh	B456	C	A	12
Lalit	B456	D	A	28

DIRECTIONS *for questions 13 and 14:* Select the correct alternative from the given choices.

13. Who among the following would have passed through the maximum number of stops?
(A) Ram (B) Tej (C) Nitin (D) Lalit

14. What is the minimum distance that any bus will travel when going from D to A?
(A) 6 km (B) 7 km (C) 12 km (D) 14 km

DIRECTIONS *for questions 15 and 16:* Type in your answer in the input box provided below the question.

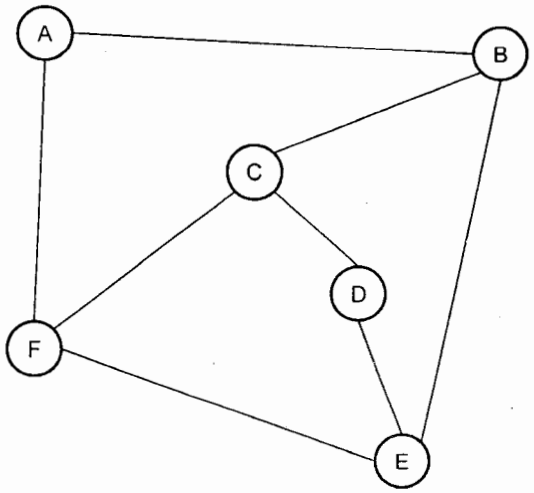
15. If a person travelled from D to F on B123, what is the fare (in ₹) that he would have paid?

16. If a person travelled from B to F on B345, what is the fare (in ₹) that he would have paid?

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

Ten runners – Jai, Gautam, Hari, Chetan, Farhan, Amar, Balu, Eswar, Dinesh and Indrajit – participated in a race such that the ten persons started the race one behind the other. Their positions at the beginning of the race was in the order mentioned above, with Jai at the front and Indrajit at the back. During the race, exactly five runners overtook other runners in the race, i.e., no runner other than these five overtook any other runner.

The following table provides the number of times each of the five runners overtook another runner during the race:



Runner	Number of times Overtook
Balu	2
Chetan	4
Dinesh	5
Amar	1
Indrajit	3

DIRECTIONS *for questions 17 to 19:* Type in your answer in the input box provided below the question.

17. How many runners would have finished the race before Dinesh?

18. What is the maximum number of runners who would have finished the race before Balu?

19. How many of the following can be the seventh runner to finish the race?

I. Amar II. Balu
III. Farhan IV. Indrajit

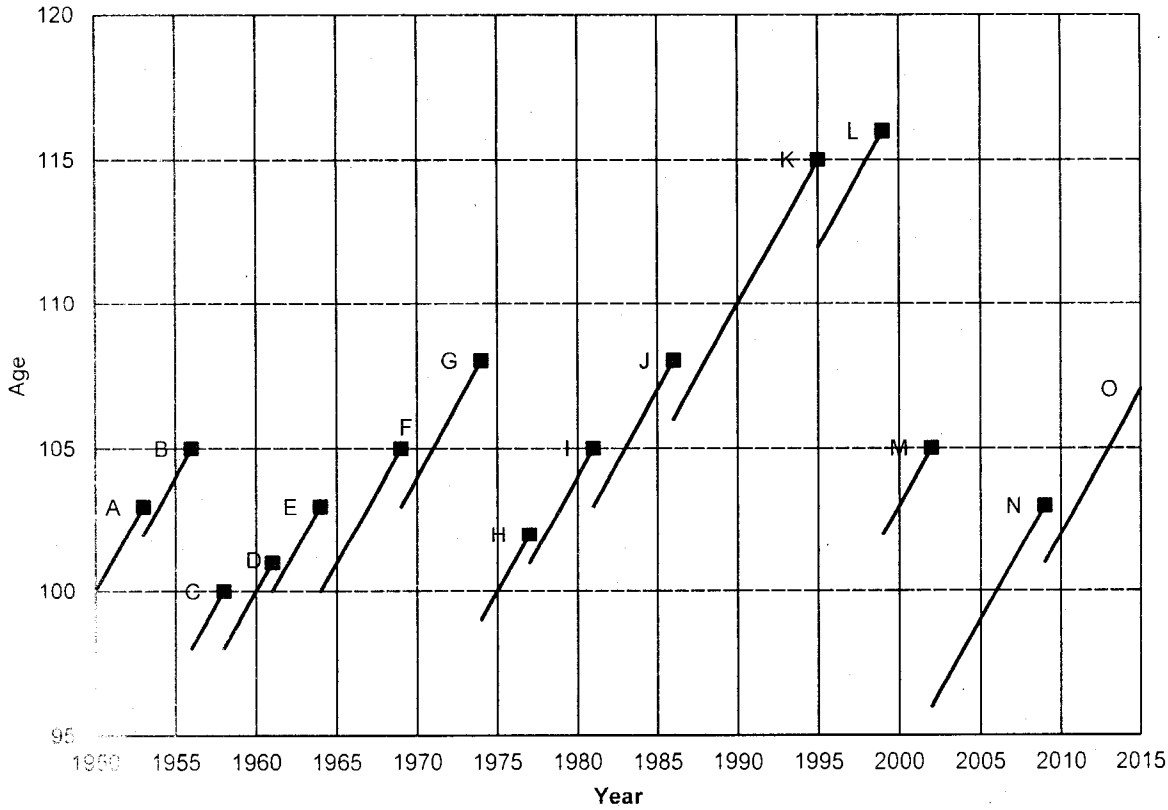
DIRECTIONS *for question 20:* Select the correct alternative from the given choices.

20. In which of the following positions would Farhan definitely not have finished the race?
(A) 6th (B) 7th (C) 8th (D) 9th

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

The chart given below provides the age of the oldest person alive during each year between 1950 and 2015, in a certain country. Each line in the chart indicates a different person. Further, the beginning of each line indicates the year in which the person became the oldest person alive, while the end of the line (indicated by a square) indicates the year in which the person had passed away.

During the given period, a total of 15 persons (indicated in the graph with the labels A through O) became the oldest person alive at any point of time.



Note: Assume that, for any person, the age of the person mentioned in the graph is his/her age at the beginning of that calendar year.

DIRECTIONS *for question 21:* Type in your answer in the input box provided below the question.

21. Among the given persons, how many persons were alive and were more than 80 years old, immediately after E became the oldest person alive?

DIRECTIONS *for question 22:* Select the correct alternative from the given choices.

22. The difference between the years of birth of which of the following pairs of persons is maximum?
(A) F, M (B) G, N (C) E, L (D) D, K

DIRECTIONS *for question 23* Type in your answer in the input box provided below the question.

23. If the difference between the years of birth for any pair of persons who became the oldest persons alive, one immediately after the other, is x, what is the maximum possible value of x?

DIRECTIONS *for question 24:* Select the correct alternative from the given choices.

24. When it became the oldest person alive, what is the average of the ages (in years) of all the persons who were alive at that point of time?
(A) 85.375
(B) 85.5
(C) 86.125
(D) 87.25

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

Nine persons, P through X, belong to the same family, spread across three generations. Among the nine persons, there are three persons with a blood group A, two persons with a blood group B, one person with a blood group AB and three persons with a blood group O. It is known that any male in the family has the same blood group as his mother, while any female in the family has the same blood group as her father.

The following information is known about the family:

(i) There are exactly three married couples in the family and the others are unmarried. Every married couple has at least one child.
(ii) No two siblings have the same blood group.
(iii) P, whose blood group is B, is a female, while Q, whose blood group is AB, is not married to W.
(iv) R, who is a male, has two children, and the blood group of R is A.
(v) T is younger than U, and both of them are females having the same blood group.
(vi) X is older than S, and both of them are males having the same blood group.

DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.

25. Who among the following is the son of R?
(A) T
(B) W
(C) S
(D) None of the above

26. What is the blood group of the father of S?
(A) A (B) B (C) O (D) AB

27. Who among the following has blood group O and has at least one child?
(A) T (B) S (C) V (D) U

28. Who among the following is the son of U?
(A) R
(B) T
(C) X
(D) None of the above

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

Three students X, Y and Z are comparing their scores in seven subjects – A, B, C, D, E, F and G. The following information is known about their scores:

(i) In each subject, exactly one student scored 80 or more marks.
(ii) Each student scored 80 or more marks in at least one subject and no two students scored 80 or more marks in the same number of subjects.
(iii) X scored less than 80 marks in subjects A and D, while Z scored 80 or more marks in subject G.
(iv) The student who scored 80 or more marks in subject B scored less than 80 marks in subject E, and the student who scored 80 or more marks in subject D also scored 80 or more marks in subject F.
(v) One of the students who scored less than 80 marks in subject A, scored 80 or more marks in subject C.
(vi) Y scored less than 80 marks in subject B.

DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.

29. If Y scored 80 or more marks in subject C, then which of the following must be true?
(A) Y scored 80 or more marks in subject E.
(B) Z scored 80 or more marks in subject B.
(C) Z scored 80 or more marks in subject E
(D) X scored 80 or more marks in subject E.

30. A student can score 80 or more marks in each of the following sets of subjects except
(A) A, E, F. (B) A, G, E.
(C) A, F, G. (D) C, G, D.

31. If Z scored 80 or more marks in subject B and less than 80 marks in subject D, then what could be the highest percentage of marks scored by Y? (Assume the maximum marks in each subject as 100)
(A) 91% (B) 87% (C) 82% (D) 85%

32. Which of the following could be an accurate matching of subjects and students who scored 80 or more marks in it?
(A) A – X, B – Y, C – Z
(B) E – X, A – Y, C – Z
(C) C – X, A – Y, E – Z
(D) F – X, C – Y, B – Z

SECTION – III
Number of Questions = 34

DIRECTIONS *for questions 1 to 3:* Type in your answer in the input box provided in the question.

1. The minimum number of straight lines required to obtain 16 non-overlapping parallelograms is [ ].

2. A book has 120 pages. A certain number of consecutive leaves are torn from the book. The sum of the page numbers on the remaining pages is 6215. The number of leaves which are torn from the book can be at most [ ].

3. If $(1012)_5 = (246)_x$, then x = [ ].

DIRECTIONS *for questions 4 to 6:* Select the correct alternative from the given choices.

4. If $n > 5$, then find the remainder when $7^n - 6n(3n - 2) - 7$ is divided by 216.
(A) 43
(B) 1
(C) 210
(D) Cannot be determined

5. The population of a country increased by 60% from the year 1970 to the year 2010. If the percentage increase in the population of the country from 1970 to 1990 was 25%, then find the percentage increase in the population of the country from 1990 to 2010.
(A) 20% (B) 24% (C) 28% (D) 30%

6. A rectangular tank has a height of h. It is fitted with two inlet pipes which can fill it in 6 hours and 12 hours respectively. An emptying pipe which can empty the tank in 16 hours is fitted at a height of $\frac{h}{4}$. If all the three pipes are opened simultaneously, find the time taken to fill the tank.
(A) 6 hours (B) 5.5 hours
(C) 4.5 hours (D) 5 hours

DIRECTIONS *for questions 7 to 10:* Type in your answer in the input box provided below the question.

7. The p^{th} term and $(p + 2)^{th}$ term of an arithmetic progression are in the ratio $p : (p + 2)$. The sum of the first $2p$ terms of the arithmetic progression and the sum of the first $3p$ terms of the arithmetic progression are in the ratio 14 : 31. Find the value of p.
[ ]

8. Two trains, of lengths 500 m and 300 m respectively, run on parallel tracks. When the trains run in the same direction, the faster train takes 80 seconds to cross the slower train. When they run in opposite directions, they take 20 seconds to cross each other. Find the speed (in km/hr) of the slower train.

[ ] km/hr

9. If the roots of the equation $x^3 - ax^2 + bx - c = 0$ are in the ratio 2 : 4 : 5, and $c = 320$, find the value of b.

[ ]

10. If $x, y, z > 0$, $x + y + z = 9$ and $f(x) = \frac{9}{x} - 1$, find the minimum value of $f(x).\ f(y).\ f(z)$.

[ ]

DIRECTIONS *for questions 11 and 12:* Select the correct alternative from the given choices.

11. In a certain company, the managers constitute 20% of the workforce by number and receive 80% of the total salary paid. On the other hand, the clerks constitute 80% of the workforce by number and receive 20% of the total salary paid. The salary of all the managers is equal and the salary of all the clerks is also equal. If the company hires a few managers and clerks after which the total salary paid to managers becomes twice that paid to the clerks, what is the minimum number of clerks hired, given that at least one new manager was hired?
(A) 6 (B) 8 (C) 12 (D) 16

12. How many integral values of x satisfy the inequality $\frac{(2x + 2^2)(4x + 4^2).....(10x + 10^2)}{(12^2 - 12x)(14^2 - 14x).....(20^2 - 20x)} < 0$?

(A) 4 (B) 5
(C) 9 (D) None of the above

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

13. If A and B are two points in the x-y plane such that A = (2, 3) and B = (–8, 6) and P is a point such that $\angle APB = \frac{\pi}{2}$ and the area of ΔAPB is 24, then how many such points P exist in the x-y plane?

[ ]

DIRECTIONS *for questions 14 and 15:* Select the correct alternative from the given choices.

14. A, B and C are three integers between 0 and 9, both inclusive, such that A! + B! + C! = ABC (where ABC is a three-digit number and not A × B × C). What is the sum of the values of A, B and C?
(A) 8 (B) 10 (C) 9 (D) 17

15. If x is real and $\left|\log_{(2x+3)}(3x - 1)\right| = 1$, then find the number of possible values of x.
(A) 0 (B) 1 (C) 2 (D) 3

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

16. The graph of $y = x^2 + 4x + 7$ is symmetric with respect to the line $x = c$. What is the value of c?

[ ]

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

17. $\lceil a \rceil$ is defined as the least integer greater than or equal to a. Let $P(a, b) = \lceil a \rceil + \lceil b \rceil + \lceil (a + b) \rceil$. Let $Q(a, b) = \lceil 2a \rceil + \lceil 2b \rceil$. Which of the following never holds true?
(A) $P(a, b) \neq Q(a, b)$
(B) $P(a, b) = Q(a, b)$
(C) $P(a, b) < Q(a, b)$
(D) $P(a, b) > Q(a, b)$

18. There are 21 people in a group. The difference between the age of the eldest person in the group and the average age of the group is 20 years. If any one person leaves the group, the average age of the remaining persons in the group will be a maximum of 21.5 years and a minimum of 20 years. Find the age of the youngest member of the group.
(A) 11 years (B) 13 years
(C) 7 years (D) 9 years

19. In a stationery store, the prices of a book, a pen and pencil are ₹15, ₹12 and ₹8 respectively. Shiva had ₹60 with him. If he spent all the money he had with him and bought a total of at least five items, comprising only books, pens and pencils, purchasing at least one item of each of the three, then in how many ways could he have purchased the items?
(A) 3 (B) 5
(C) 4 (D) None of the above

20. What is the units digit of $3^{3^{3^{3^{\cdot^{\cdot^{\cdot^{3}}}}}}}$ (3×3 threes), where the total number of 3's is 333?
(A) 3 (B) 1 (C) 7 (D) 9

DIRECTIONS *for questions 21 and 22:* Type in your answer in the input box provided below the question.

21. A function f(x) is said to be strictly increasing if $f(x_1) > f(x_2)$ for $x_1 > x_2$. The number of strictly increasing functions that can be defined from set A with 4 positive integers to set B with 6 positive integers is

[ ].

22. If C_i and C_j represent two circles, then $nCT(C_i, C_j)$ is defined as the number of common tangents that can be drawn to C_i and C_j. Given three circles C_1, C_2 and C_3, such that $nCT(C_1, C_2) = 4$ and $nCT(C_1, C_3) = 3$, how many of the following values can $nCT(C_2, C_3)$ assume?

(i) 0 (ii) 1 (iii) 2 (iv) 3 (v) 4

[ ]

DIRECTIONS *for questions 23 to 25:* Select the correct alternative from the given choices.

23. If $p \geq 2$, then which of the following inequalities definitely hold/s true?

(A) $p^3 > 10^{p-1}$

(B) $(p+1)^4 < 10^{p+1}$

(C) $p > \left(1 + \frac{1}{p^{10}}\right)^{\frac{10}{p}}$

(D) More than one of the above

24. A factory produces nuts and bolts. A machine in it produces only nuts while another produces only bolts. The machine producing only nuts produces 400 nuts per minute and needs to be cleaned for 15 minutes after production of 2000 nuts. The machine producing only bolts produces 300 bolts per minute and needs to be cleaned for 15 minutes after production of 3000 bolts. Find the minimum time (in minutes) required to produce 12000 pairs of bolts and nuts if both machines are operated simultaneously.

(A) 85 (B) 105 (C) 100 (D) 120

25. Let $\{b_i\}$, where i is a natural number, be a sequence of real numbers. If $b_{p+q} = b_p + b_q - pq$ and $b_8 = 100$, then what is the value of b_{15}?

(A) 135 (B) 130 (C) 180 (D) 225

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

26. A 15-foot high pole, AB, stands in an open field and directly to its west, stands a 10-foot high pole. At 10:00 a.m., the tip of the shadow of the first pole falls 5 feet to the east of the foot of the second pole. When the tip of the shadow of the second pole falls at the same point, the tip of the shadow of the first pole falls at Q. How far (in feet) is Q from the foot of the first pole?

Enter your answer as a decimal value, rounded off to two decimal places.

DIRECTIONS *for questions 27 and 28:* Select the correct alternative from the given choices.

27. A cuboidal room with a square floor has a volume of 12500 cubic feet. Anil painted all the walls and the ceiling of the room at the rate of 1 square foot per minute. Find the difference in the time taken to paint the ceiling and the time taken to paint all the walls, if the perimeter of the floor is 100 feet.

(A) 21 hours and 35 minutes
(B) 20 hours and 25 minutes
(C) 23 hours and 15 minutes
(D) 22 hours and 55 minutes

28. There are three points – P, B and Q – on the ground, in a straight line, with a pole AB, at B, such that the pole AB is leaning away from P and towards Q. If B is 20 m away from both P and Q, and the angles of elevation of the top of the pole as observed from P and Q are 30° and 60° respectively, find the length of the pole.

(A) 20 m (B) $10\sqrt{3}$ m
(C) 10 m (D) Cannot be determined

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

29. A cuboid has a total surface area of A. It was cut into 120 identical cubes. If the total surface area of these cubes is KA, what is the least possible value of K?

Enter your answer as a decimal value, rounded off to three decimal places.

DIRECTIONS *for questions 30 to 33:* Select the correct alternative from the given choices.

30. If the a^{th}, b^{th}, c^{th} terms of a geometric progression are p, q, r respectively, then $p^{b-c} \cdot q^{c-a} \cdot r^{a-b} =$

(A) 0.
(B) 1.
(C) $(a-b)(b-c)(c-a)$.
(D) None of the above

31. $\frac{1}{1!} \times \frac{2}{2!} \times \frac{3}{3!} \times \frac{4}{4!} \ldots\ldots \frac{n}{n!} =$

(A) $\frac{1! + 2! + 3! \ldots\ldots + (n-1)!}{n!}$

(B) $\frac{1}{2^{n-1}3^{n-2}4^{n-3}\ldots\ldots(n-1)^2}$

(C) $\frac{1}{2^{n-2}3^{n-3}4^{n-4}\ldots\ldots(n-1)^1}$

(D) $\frac{n}{n!(n-1)!}$

32. A, B and C start simultaneously from P and go towards Q. A being the fastest, reaches Q, turns back without changing his speed and proceeds towards P. He meets B at a distance of 30 metres from Q and C at a distance of 70 metres from Q. B also reaches Q, turns back without changing his speed and proceeds towards P. He meets C on the way at a distance of d metres from Q. If PQ = 210 metres, find the value of d.

(A) 42 (B) 84 (C) 126 (D) 168

33. If for the quadratic equation $px^2 + qx + r = 0$, the sum of the squares of its roots is equal to the sum of the cubes of its roots and $q^3 + pq^2 = 2p + 3q \neq 0$, then what is the value of pr?

(A) 0 (B) 1
(C) 2 (D) Cannot be determined

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

34. Six boxes are numbered 1, 2, 3, 4, 5 and 6. Each box must contain either a white ball or a black ball, but not both. At least one box must contain a black ball and boxes containing black balls must all be consecutively numbered. Find the total number of ways of filling the boxes.