

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.

In 1985, the chemist Steven A. Benner sat down with some colleagues and sketched out a way to expand the alphabet of DNA. He has been trying to make those sketches real ever since. Recently, Dr. Benner and a team of scientists reported success: in a paper, published in *Science*, they said they have in effect doubled the genetic alphabet.

Natural DNA is spelled out with four different letters known as bases — A, C, G and T. Dr. Benner and his colleagues have built DNA with eight bases — four natural, and four unnatural. They named their new system Hachimoji DNA (hachi is Japanese for eight, moji for letter). Crafting the four new bases that don't exist in nature was a chemical tour-de-force. They fit neatly into DNA's double helix, and enzymes can read them as easily as natural bases, in order to make molecules...

Hachimoji DNA could have many applications, including a far more durable way to store digital data that could last for centuries ... It also ... [offers] the possibility that the four-base DNA we are familiar with may not be the only chemistry that could support life.

The four natural bases of DNA are all anchored to molecular backbones. A pair of backbones can join into a double helix because their bases are attracted to each other. The bases form a bond with their hydrogen atoms. But bases don't stick together at random. C can only bond to G, and A can only bond to T. These strict rules help ensure that DNA strands don't clump together into a jumble. No matter what sequence of bases are contained in natural DNA, it still keeps its shape.

But those four bases are not the only compounds that can attach to DNA's backbone and link to another base — at least on paper. Dr. Benner and his colleagues thought up a dozen alternatives.

...Dr. Benner's initial forays impressed other chemists...[like] Floyd E. Romesberg, of the Scripps Research Institute in San Diego...[who] decided to try to create his own bases.

Dr. Romesberg chose not to make bases that linked together with hydrogen bonds; instead, he fashioned a pair of oily compounds that repelled water. That chemistry brought his unnatural pair of bases together...Dr. Romesberg and his colleagues fashioned enzymes that could copy DNA made from both natural bases and unnatural, oily ones. In 2014, the scientists engineered bacteria that could make new copies of these hybrid genes.

In recent years, Dr. Romesberg's team has begun making unnatural proteins from these unnatural genes. He founded a company, Synthorx, to develop some of these proteins as cancer drugs. At the same time, Dr. Benner [...] and his colleagues succeeded in creating one pair of new bases. Like Dr. Romesberg, they found an application for their unnatural [six-base] DNA...[it] became the basis of a new, sensitive test for viruses in blood samples...

...Hachimoji DNA ...might someday encode a movie or a spreadsheet. Today, movies, spreadsheets and other digital files are typically stored on silicon chips or magnetic tapes. But those kinds of storage have serious shortcomings. [T]hey can deteriorate in just years. DNA, by contrast, can remain intact for centuries. Last year, researchers at Microsoft and the University of Washington managed to encode 35 songs, videos, documents, and other files, totalling 200 megabytes, in a batch of DNA molecules...

1. All of the following are advantages of the pathbreaking research mentioned in the passage EXCEPT that:
 - (A) Hachimoji DNA can provide storage that will remain intact for a long time.
 - (B) six-base DNA can help with testing for viruses present in blood samples.
 - (C) unnatural proteins made of hybrid genes have potential as cancer drugs.
 - (D) hybrid genes fashioned with a pair of oily compounds can repel water.
2. Which of the following least strengthens the author's argument in favour of the Hachimoji DNA?
 - (A) Six-base DNA and eight-base DNA have a lot of practical applications.
 - (B) DNA molecules could offer a permanent solution for efficient long-term storage.
 - (C) Four-base DNA is currently the only existent form known to humans.
 - (D) Enzymes can read unnatural DNA just as easily as natural ones.
3. The author's explanation for why DNA strands don't end up in a confused tangle is that:
 - (A) once a double helix is formed, it cannot be extended further.
 - (B) the bases of molecular backbones only stick to other select bases.
 - (C) hydrogen atoms are involved in the bonding of the bases.
 - (D) very few permutations are possible with just four bases.
4. The author surmises that four-base DNA may not be the only chemistry supporting life because:
 - (A) it is impossible to connect natural bases to other hybrid bases.
 - (B) the bases C and A can only bond to G and T respectively.
 - (C) hydrogen atoms help in forming bonds between bases.
 - (D) it is now known that A, C, G and T are not the only compounds that can attach to DNA's backbone.
5. Which of the following is not a factor that made the expansion of DNA alphabet possible?
 - (A) New bases could fit into DNA's double helix.
 - (B) Enzymes could read new bases as easily as they did the natural ones.
 - (C) Bases could be linked together with alternatives other than hydrogen bonds.
 - (D) Bases don't stick together at random and are driven by strict rules.

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.

[Artificial intelligence] (AI) is poised to make high-fidelity forgery inexpensive and automated, leading to potentially disastrous consequences...Automated forgery is already prevalent on social media...Twitter has uncovered thousands of automated accounts linked to Russia in the months preceding the 2016 election, according to The Washington Post. Facebook estimated that fake news spread by Russian-backed bots from January 2015 to August 2017 reached potentially half of the 250 million Americans who are eligible to vote.

...The problem extends far beyond bots. [Recent] advances in image processing have enabled the creation of realistic fake video. Researchers demonstrated this...with AI-generated video of former President Barack Obama speaking phrases that were previously only audio clips. Then came "deepfakes," AI-generated videos of entirely new facial expressions of a target person created by stitching together two faces in an eerily convincing way... A viral video of Obama issuing a warning about deepfakes was, itself, a fake.

... The adage "on the Internet, nobody knows you're a dog" implies that you cannot be certain of the author or origin of most items you receive via email, through social media, or even by phone. This Internet blindness is the basis for "phishing" — cyber-attacks where a communication purporting to be from a trusted source induces you to reveal private information such as a password or credit card number. Today, the text of automatically generated phishing e-mails is easy to spot as phony, but AI is about to change that.

Historically, society has relied on signatures to ensure authenticity...Marks, stamps, and seals evolved into handwritten text as literacy became widespread, and references to signing documents appear throughout history.

On the Internet, we rely on digital signatures. A digital signature is a computer method (based on cryptography) of ensuring that an item wasn't tampered after it was signed. Services like DocuSign certify contracts using digital signatures. Automated messages between websites can also be authenticated by digital signatures, but digital signatures are not widely used to certify the authorship of e-mails, social media posts, images, videos, etc.

... [We] need to act to make digital signatures de rigueur as a means of authentication of digital content. First, we need to certify signatures, which can be done by central authorities, or via more democratic computer methods such as encryption and blockchain. Second, we need to make the acts of signing and verifying signatures as seamless as possible. Signing should be enabled by default in our email software, word processor, smartphone cameras, and in any production of digital content. Our browsers, social-media applications, and other media-reading software should highlight whether content is signed, and by whom. Finally, and perhaps most challenging, we need to promulgate the norm that any item that isn't signed is potentially forged. We don't accept checks that aren't signed — the same should hold for digital content.

Of course, we want to preserve the option of anonymity so that digital signatures aren't used to suppress dissent or discourage whistleblowers. Moreover, we want to allow for pseudonyms so that an author can choose to hide their identity but still be recognized as a particular individual or organization. Digital signatures will not prevent a bot from masquerading as some person, but the signatures will stop the bot from impersonating you, and from disseminating content that you didn't author in your name ...

6. The author mentions 'deepfakes' to suggest that:
 - (A) powerful people like Obama can claim that their videos have been faked.
 - (B) the words spoken by a famous person can be switched with a different audio clip.
 - (C) one cannot entirely trust the authenticity of videos.
 - (D) audios can be tampered with more easily than videos.
7. The author asserts in the last para that digital signatures can prevent bots from:
 - (A) impersonating the person who uses the signatures.
 - (B) disseminating content anonymously.
 - (C) masquerading as a real person.
 - (D) spreading fake news.
8. Which of the following statements about anonymity will the author most likely agree with?
 - (A) Anonymity defeats the purpose of imposing digital signatures to prevent forgery.
 - (B) Anonymity encourages dissenters to turn into whistleblowers for the greater good.
 - (C) Anonymity allows a particular individual or organisation to avoid taking responsibility for whatever has been published.
 - (D) Anonymity can ensure that digital signatures don't discourage whistleblowers.
9. Which of the following is not a step suggested by the author as a way of perpetuating the habit of using digital signatures?
 - (A) The authenticity of documents without digital signatures should be questioned.
 - (B) It should be easy to find out whether the content has been signed or not.
 - (C) The process of signing digital content should be integrated seamlessly.
 - (D) Production of digital content should mandatorily impose signing.
10. The author mentions the adage 'on the internet, nobody knows you are a dog' to demonstrate that:
 - (A) authenticity of content cannot be assured without relying on digital signatures.
 - (B) cyber-attacks are commonplace because of internet blindness.
 - (C) items received on internet could be apocryphal.
 - (D) private information shouldn't be given away on emails or social media.

DIRECTIONS for questions 11 to 14: The passage given below is accompanied by a set of four questions. Choose the best answer to each question.

In 2010, photographer Rose-Lynn Fisher published a book of remarkable images that captured the honeybee in an entirely new light. By using powerful scanning electron microscopes, she magnified a bee's microscopic structures by hundreds or even thousands of times in size, revealing startling, abstract forms that are far too small to see with the naked eye. Now, as part of a new project called "Topography of Tears," she's using microscopes to give us an unexpected view of another familiar subject: dried human tears.

"I started the project about five years ago, during a period of copious tears, amid lots of change and loss — so I had a surplus of raw material," Fisher says. After the bee project and one in which she'd looked at a fragment of her own hip bone removed during surgery, she'd come to the realization that "everything we see in our lives is just the tip of the iceberg, visually," she explains. "So, I had this moment where I suddenly thought, 'I wonder what a tear looks like up close?'"

When she caught one of her own tears on a slide, dried it, and then peered at it through a standard light microscope, "It was really interesting. It looked like an aerial view, almost as if I was looking down at a landscape from a plane," she says. "Eventually, I started wondering — would a tear of grief look any different than a tear of joy? And how would they compare to, say, an onion tear?"

This idle musing ended up launching a multi-year photography project in which Fisher collected, examined and photographed more than 100 tears from both herself and a handful of other volunteers, including a new-born baby.

Scientifically, tears are divided into three different types, based on their origin. Both tears of grief and joy are psychic tears, triggered by extreme emotions, whether positive or negative. Basal tears are released continuously in tiny quantities (on average, 0.75 to 1.1 grams over a 24-hour period) to keep the cornea lubricated. Reflex tears are secreted in response to an irritant, like dust, onion vapours or tear gas.

All tears contain a variety of biological substances (including oils, antibodies and enzymes) suspended in saltwater, but as Fisher saw, tears from each of the different categories include distinct molecules as well. Emotional tears, for instance, have been found to contain protein-based hormones including the neurotransmitter leucine enkephalin, a natural painkiller that is released when the body is under stress.

Additionally, because the structures seen under the microscope are largely crystallized salt, the circumstances under which the tear dries can lead to radically dissimilar shapes and formations, so two psychic tears with the exact same chemical makeup can look very different, up close. "There are so many variables — there's the chemistry, the viscosity, the setting, the evaporation rate and the settings of the microscope," Fisher says.

As Fisher pored over the hundreds of dried tears, she began to see even more ways in which they resembled large-scale landscapes, or as she calls them, "aerial views of emotion terrain."

"It's amazing to me how the patterns of nature seem so similar, regardless of scale," she says. "You can look at patterns of erosion that are etched into earth over thousands of years, and somehow they look very similar to the branched crystalline patterns of a dried tear that took less than a moment to form."

11. The difference between onion tears and emotional tears is that:
 - (A) the former are psychic tears, whereas the latter are basal tears.
 - (B) the former are triggered by emotions, whereas the latter are triggered by irritants.
 - (C) the former are psychic, whereas the latter are triggered by irritants.
 - (D) the former are reflex tears, whereas the latter are psychic tears.
12. Fisher uses the expression 'aerial views of emotion terrain' as a metaphor for
 - (A) the emotions, she goes through when studying tears.
 - (B) the science behind the emotions that trigger tears.
 - (C) the variables in the terrain that cause varying tear patterns.
 - (D) tear patterns after they have dried.
13. Two psychic tears with the same composition can have dissimilar terrains under the microscope because of all of the following EXCEPT:
 - (A) the viscosity and the evaporation rate of the tear drops could be different.
 - (B) the percentage of crystallized salt is large.
 - (C) the settings of the microscope may not be the same.
 - (D) there are several variables that influence the pattern of a dried tear.
14. Fisher calls everything we see in our lives as just the tip of the iceberg because:
 - (A) there's lot more to microscopic structures than what meets the eye.
 - (B) we miss out on all the patterns and detail unless we take a look up-close.
 - (C) all patterns of nature look similar under the microscope.
 - (D) what is visible to the naked eye is starkly in contrast to the microscopic view.

DIRECTIONS for questions 15 to 19: The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

For years, the luxury industry has waged a battle against counterfeiters. It has invested heavily in ultra-sophisticated tech solutions which use the latest advances in nanotechnology, internet of things (IoT), and AI to authenticate products. It lobbies governments to extend enforcement bodies' powers to seize and destroy fake goods, to prosecute buyers and dealers, and to block access to websites that sell counterfeit goods. And then there are the lawyers: LVMH, a luxury goods conglomerate, alone employs at least 60 lawyers and spends \$17 million annually on anti-counterfeiting legal action.

These efforts are not paying off. The total trade in fakes is estimated at around \$4.5 trillion, and fake luxury merchandise accounts for 60% to 70% of that amount, ahead of pharmaceuticals and entertainment products ... Perhaps 40% of the sales in luxury fakes take place online, as today's counterfeiters milk the ubiquity and anonymity of the internet space to the last drop. For every e-commerce platform like Alibaba that cracks down on fakes, a new one emerges that allows goods to be shipped directly from manufacturers.

So what should luxury goods companies be doing instead? We interviewed 32 professionals across four panels: luxury executives, representatives of luxury industry associations, experts on anti-counterfeiting from academia and the public sector, and executives from the music and pharmaceuticals industries, which have been more successful than luxury goods firms in fighting against counterfeiting.

What we hear suggests that luxury firms' failure to contain the growth in counterfeiting is rooted in a hollowing out of their brands. Many luxury brands have become symbols of status and privilege but not much else. The emphasis across the industry has been on signalling rather than delivering luxury; intangible over tangible product attributes; and the logo over all other markers of quality.

This philosophy has been consistently applied to supply chains, manufacturing, and pricing: By relocating production to low-cost countries, luxury firms severed the centuries-old association of luxury goods with their historical places of origin. The outsourcing also led to relaxed control over supply chain, design, and manufacturing just as counterfeiters were putting unprecedented pressure on each of these processes.

At the same time, despite the cost savings, luxury products' sticker prices have risen dramatically. At first, the idea was to cushion the impact of the growing traffic of Chinese tourists buying abroad and reselling at home. But the hikes escalated rapidly and by 2014, a Chanel handbag cost 70% more than it had just five years earlier. Other brands

followed suit, raising prices at more than twice the rate of the mainstream market. Buoyed by initial success of this pricing strategy, many firms also phased out their more affordable, entry-level brands. For example, Dolce & Gabbana in 2012 discontinued its profitable but less expensive D&G brand.

Because of these developments, luxury brands have become disconnected from their physical products, which reduces customer concerns about buying fakes. Does spending \$2,500 on a branded item made in China look smart when you can get a made-in-China fake version (possibly from the branded company's supplier) that looks pretty much the same? The anonymity of the new digital distribution networks for fakes only makes the decision easier.

This suggests that luxury sector's solution to the counterfeiting challenge lies less in fighting counterfeiters and more in rediscovering what made the brands great in the first place.

15. Which of the following can be inferred from the second para of the passage?
- (A) Trading fake luxury merchandise is easier than trading entertainment products.
 - (B) The authenticity of items propagated on the internet cannot be trusted.
 - (C) e-commerce platforms can intervene and prevent the trading of fakes.
 - (D) direct shipping of goods from manufacturers to customers allows replacing originals with fakes.
16. The author mentions LVMH employing at least 60 lawyers to demonstrate that:
- (A) the luxury industry invests substantially on anti-counterfeiting legal action.
 - (B) it is difficult to wage a legal battle against counterfeiters.
 - (C) prosecuting buyers and dealers of fake goods is an expensive ordeal.
 - (D) the legal efforts undertaken by the luxury industry are not paying off.
17. By hollowing out of brands, the author means that:
- (A) luxury brands charge a premium for the logo alone.
 - (B) luxury brands are not maintaining the intangible aura that was their hallmark.
 - (C) luxury brands do not offer value for money.
 - (D) luxury brands focus more on the brand name than on the quality of the product.
18. The author will not approve of all of the following measures taken by a luxury brand, Amnesia, to increase its profits EXCEPT:
- (A) Instead of manufacturing its leather goods in Italy, whose leather was originally responsible for the company's success, Amnesia has shifted manufacturing operations to Vietnam to lower its product prices.
 - (B) Amnesia is now listing its apparel on ecommerce websites, something it hasn't done since its inception a few decades ago.
 - (C) Amnesia has doubled the price of its highly popular lower-end handbags.
 - (D) Amnesia has allocated more budget for marketing the brand than for providing customer service.
19. Which of the following, if found to be true, would negate the main message of the passage?
- (A) Companies spending more on fighting counterfeiters than what the industry average is, have reported an increase in quarterly sales.
 - (B) Companies spending on new product lines than on old ones have reported an increase in quarterly sales.
 - (C) Increased spending on anti-counterfeiting exercises has led to an increased brand visibility for the company.
 - (D) Companies spending on fighting counterfeiters rather than on increasing satisfaction levels of customers have reported an increase in net profits.

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.

Although Prime Minister Narendra Modi enjoyed many foreign policy successes during his term in office, the incoming government in New Delhi will have to confront serious challenges both around India's periphery and farther beyond. Grounded in a vision of India as a leading power in the international system, Modi has displayed an extraordinary international activism unprecedented since Jawaharlal Nehru's long tenure, engaging India in global issues ranging from climate change to strategic realignments.

For all of Modi's achievements, however, India's strategic aims over the last half-decade were often frustrated by both contextual constraints and limited national capabilities. A successful Indian foreign policy must create external circumstances conducive to realising India's fundamental goals, namely, protecting its physical security and its decisional autonomy, enlarging its economic prosperity and its technological capabilities, and realising its status claims on the global stage.

Attaining these objectives requires New Delhi to engage at three different levels abroad: within its immediate periphery, among the world's middle powers, and with the great powers of the system...

India's problems within the subcontinent and around its immediate periphery have always been significant... Occasional diplomatic blunders notwithstanding, India's limitations in material power [and inadequate economic development] has proven to be the primary obstacle to establishing political hegemony among its smaller neighbours... By pursuing inward-looking growth, India has failed to integrate its region economically. To vivify its regional primacy, therefore, India must accumulate greater power at home and deepen interdependence with its neighbours.

...India's relations with most of the key middle powers have improved dramatically. The Modi government has especially utilised India's partnership with Japan to attract economic investments, acquire critical technology, gain support for India's permanent membership of the UN Security Council, and create an evolving intra-Asian balance to China. In addition, Modi's successful outreach to the United Arab Emirates and Saudi Arabia has enhanced India's quest for stable energy supplies and increased foreign investment while also limiting their traditional support for Pakistan.

Much to India's chagrin, however, Moscow today has ceased to be a reliable partner in balancing China within Asia as India and Russia struggle to find strategic convergence. India's relations with the middle powers remain robust apart from this exception, but these ties — despite their importance — cannot compensate for the hazards posed by India's neighbours and the great powers.

India faces problems from both great powers: intensifying threats from China and geopolitical fickleness from the United States. Hopefully the problems with the latter are a temporary feature of the current Trump administration.

The challenges embodied by China, however, are more enduring because China is still growing and is located next door. China has long recognised that India represented one of the three major Asian threats to its quest for continental, if not global, pre-eminence... China is now also intensely penetrating South Asia and the wider Indian Ocean region, further diminishing India's influence... India's relationship with the United States, therefore, matters greatly, but it remains hostage to internal anxieties...

...If India is to realise its great power ambitions, the next government will have to accelerate economic reforms, strengthen India's institutions, preserve its constitutional ethos, and protect its internal cohesion, all of which have floundered dangerously in recent years. Today, when India's claims to exceptionalism will not suffice either to protect its security or to increase its influence, its missteps within will have outsized impact abroad.

20. Which of the following is the author least likely to approve of as a successful foreign policy?
- A policy that leads to doubling of the GDP, a tangible indicator of the state of the economy
 - A policy that incentivises the world's best technology companies to start manufacturing in India
 - A policy that prevents other countries from interfering in India's sovereign matters
 - A policy that enables India's inclusion into prestigious groups of countries owing to its tangible progress
21. Which of the following, if true, most weakens the author's reasons to suggest greater importance for the United States in India's foreign policy?
- A majority of the world powers consider India to be at par with China.
 - China's growth rate has substantially slowed down and is below that of India.
 - United States doesn't hold as much heft in world politics as China does.
 - China aims to build a collaborative relationship with all of its neighbours, including India.
22. The author attributes India's failure to establish leadership credentials in its immediate periphery primarily to:
- diplomatic blunders.
 - greater interdependence with its neighbours.
 - limited material power.
 - China's political hegemony.
23. Which of the following most agrees with the author's opinion on India's relationship with the United States?
- One can't help but be cynical about the fickleness of the India-US relationship.
 - One can be optimistic that the temporary animosity between India and the US will be resolved.
 - India's internal turmoil has adversely affected the India-US relationship.
 - The current Trump administration's adverse influence on the India-US relationship need not be a long-term pattern.
24. All of the following can be inferred from the passage EXCEPT:
- Economic prosperity and technological capabilities help a country realise its status claims on the global stage.
 - Self-centred growth runs against a country's aspirations to establish political hegemony in a region.
 - India's internal chaos and the deterioration of constitutional ethos could dent its ambition to be recognised as a world leader.
 - Japan and Russia can help India counter the global influence of China.

DIRECTIONS for question 25: 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.

25. (1) If a man could juggle a ball a thousand times, then it proved only that he ought to join the circus.
- (2) That brain, as well as his famously agile feet, made him a local hero in Holland and Spain and, by extension, all over football-mad Europe.
- (3) The true beauty of the world's most beautiful game, according to Johan Cruyff, didn't lie in tricky technique.
- (4) It was great when Rudolf Nureyev said that Cruyff should have been a dancer, but Cruyff was not just using his long, lean body when he played football; he was mostly using his brain.

DIRECTIONS for question 26: 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.

26. (1) At the end of the book, Sears answers frequently asked questions from readers on living and eating in the zone.
 (2) You may have engaged in health habits that were not good for you in the past, but at any time, you can make a decision to change.
 (3) Barry Sears's answer is a classic: "Always remember that, no matter what you have eaten in the past, you are only one meal out of the zone."
 (4) One of the questions I especially liked was from someone who wrote, "What if you 'fall off the wagon' and you eat a large meal with desert, or eat too much as people do over the holiday season?"
 (5) In the book *The Zone*, Barry Sears compares the body to a factory and the food you eat to a chemical that goes into the production process of the factory, and he teaches you how to eat in a healthy way.

DIRECTIONS for question 27: 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.

27. (1) Any translator attempting to bring a work of literature into his or her own language must weigh the many considerations and find a solution that hews closely to meaning while being true to the author's style.
 (2) To name a few effects, we have rhythm and cadence, register, dialect, irony, humour and slang – all the elements that make up what we call an author's style.
 (3) Once words begin to be strung together into sentences, a host of other linguistic effects is added.
 (4) Language is not merely a set of signifiers and signified; words are part of culture and have both denotations and connotations, and no possible literal translation can communicate such things.

DIRECTIONS for question 28: The paragraph given below is followed by four alternative summaries. Choose the option that best summarises the paragraph.

28. In order to simplify the process of perceiving complex stimuli, we tend to classify people and events into familiar categories and assign to individual members the attributes commonly associated with those categories. This tendency to generalize from the perceived attributes of a group to the perceived attributes of an individual belonging to that group is called stereotyping. We know that

there are negative stereotypes such as: Truck drivers drive recklessly, Americans are materialistic, politicians are corrupt, and management graduates are job-hoppers. However, there are positive stereotypes as well: Bengalis excel in music, Gujaratis have an uncanny sense of business, and management graduates are industrious. Stereotyping is a pervasive perceptual process and we are all familiar with stereotypes based upon caste, religion, region, age, sex, organizational role, etc. Stereotyping often leads to erroneous impressions and judgements because the perceiver overlooks significant individual differences among the members of a group. Stereotype also makes it difficult to perceive some traits actually present in an individual which are not typically attributed to his group.

- (A) Some stereotypes are widely used and one need not think while using them. But perceptual tendencies inevitably lead to erroneous judgements and subjectivity because individual traits are missed for the overall labels attributed to the group.
 (B) Stereotypes are of two types: positive and negative. Positive stereotypes serve to simplify the process of perceiving complex stimuli. Negative stereotypes cause one to overlook significant individual differences among the members of a group.
 (C) Stereotyping involves a generalizing from the perceived attributes of a group to the perceived attributes of an individual belonging to that group. Examples of stereotypes such as "Bengalis excel in music" or "politicians are corrupt" abound in our lives.
 (D) By stereotyping, we perceive that a person from a group has a whole range of characteristics and abilities that we assume all members of that group have. This social categorization can be positive or negative. Because stereotypes ignore individual differences, they can distort a person's perception and result in misconceptions.

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) The pleasure-centered person, too soon bored with each succeeding level of "fun," constantly cries for more, and so the next new pleasure has to be better, more exciting, with a bigger "high."
 (2) Innocent pleasures in moderation can provide relaxation for the body and mind and can foster family and other relationships.
 (3) While the glitter of pleasure-centered lifestyles is graphically portrayed, the natural result of such lifestyles – on the inner person, on productivity, on relationships – is seldom accurately seen.
 (4) A person in this state becomes almost entirely narcissistic, interpreting all of life in terms of the pleasure it provides to the self here and now.
 (5) But pleasure, per se, offers no deep, lasting satisfaction or sense of fulfilment.

DIRECTIONS for questions 30 and 31: The passage given below is followed by four summaries. Choose the option that best captures the author's position.

30. Incorporating bones into the smithing process did in fact make Scandinavian swords stronger, but it wasn't magic — it was technology. What ancient smiths could not have realized is that they were in fact mixing their bog iron with carbon to make a rudimentary form of steel. Carbon is present in all organic matter, and the same is true for bones. By burning bones in a low-oxygen environment, ancient smiths would have produced bone-coal, much in the same way that burning wood in a low-oxygen environment makes charcoal. Researchers have conducted experiments that recreate the process of forging a sword using bog iron and bone-coal; the carbon from the bones can penetrate up to 3mm deep into bog iron, enough to significantly strengthen the sword.
- (A) What Scandinavians did by using bones in smithing was not magic, but was the science of integrating carbon into iron to make it stronger.
- (B) Ancient Scandinavian smiths understood the science behind transforming iron into a rudimentary form of steel using bone-coal.
- (C) Scandinavian smiths inadvertently forged bog iron swords which were way stronger than the ordinary ones due to carbon penetration.
- (D) Bone coal when burnt in low oxygen conditions penetrates into bog iron to make it stronger.
31. One of the great cruelties and great glories of creative work is the wild discrepancy of timelines between vision and execution. When we dream up a project, we invariably underestimate the amount of time and effort required to make it a reality. Rather than a cognitive bug, perhaps this is the supreme coping mechanism of the creative mind — if we could see clearly the toil ahead at the outset of any creative endeavour, we might be too dispirited to begin, too reluctant to gamble between the heroic and the foolish, too paralyzed to walk the long and tenuous tightrope of hope and fear by which any worthwhile destination is reached.
- (A) Underestimating the amount of time and effort required for implementing a vision protects the creative endeavour from being sabotaged by fear of the toil of execution.
- (B) The paradox of creative work is that one cannot see the toil at the time of dreaming up a vision, for if we did, we wouldn't be able to take it to the eventual destination.
- (C) It is not as easy to execute a creative vision as we deem it to be, but if we knew that at the start, we would never undertake the task in the first place.
- (D) We are never sure how much time and effort is required to execute our vision, but that is how we manage to keep our creative juices flowing despite the hardships and the risks.

DIRECTIONS for question 32 and 33: 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) To reach the widest possible audience, most of them cover similar material: a miscellany of models that are not always consistent with each other or even with themselves.
- (2) Macroeconomics is difficult to teach, partly because its theorists disagree about so much.
- (3) Many professors, subsequently, must teach things they do not believe in themselves.
- (4) It is difficult also because the textbooks disagree about so little.

33. (1) "Black hole" is the rare physics term that is evocative enough to attract public attention, especially compared to the previous phrase for the concept, "gravitationally collapsed object."
- (2) In Dicke's mind, that hot, fetid, stinking, torturous hellhole from which few men could emerge was an apt metaphor for the cosmological singularity that acts as a physical manifestation of Dante's warning in *Inferno* to "Abandon hope all ye who enter here."
- (3) Dante was a poet, and the word "black hole" is a metaphor, but it's important to remember that pain and loss go beyond language; they are not abstractions, but very real.
- (4) Coined by physicist Robert H. Dicke in the early '60s, the term was appropriated from the infamous dungeon in colonial India that held British prisoners and was known as the "Black Hole of Calcutta."

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) "Every walk is a sort of crusade," Thoreau exulted as he championed the spirit of sauntering in an era when the activity was largely a male privilege.
- (2) Lauren Elkin brings some of these women and their emancipatory, culture-shifting legacy to life in *Flâneuse: Women Walk the City in Paris, New York, Tokyo, Venice, and London* (public library).
- (3) Every right begins as a privilege and Elkin sets out to reclaim this once-male privilege as a basic human right of the modern urban dweller, — one that requires the resexing of flâneur into flâneuse.
- (4) For a woman, these everyday crusades meant the dragging of long skirts across inhospitable terrains, before unwelcome gazes.
- (5) It would take a century and a half of bold women conquering the mountains and reimagining the streets before Rebecca Solnit could compose her exquisite manifesto for 'wanderlust', reclaiming walking as an activity that vitalizes the mind — the mind that "has no gender."

SECTION – II
Number of Questions = 32

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

Sampath was comparing the specifications of seven different laptops, L1 through L7, on five parameters – Processor, RAM, Graphics Memory, Screen Size and OS. The processor of any laptop can be i5 or i7. The RAM of any laptop can be 8GB or 16GB. The Graphics Memory of any laptop can be 6GB or 8GB. The Screen Size of any laptop can be 14" or 15". The OS of any laptop can be Windows or Linux.

Further, he calculated the Similarity Index for every pair of laptops. The Similarity Index for any pair of laptops is the number of parameters in which they have the same specifications.

The first table below provides the Similarity Index for each pair of laptops, while the second table below provides partial information about the parameters for each laptop:

Similarity Index							
	L1	L2	L3	L4	L5	L6	L7
L1	5	4	2	1	2	3	4
L2	4	5	1	0	3	4	3
L3	2	1	5	4	3	0	1
L4	1	0	4	5	2	1	2
L5	2	3	3	2	5	2	1
L6	3	4	0	1	2	5	4
L7	4	3	1	2	1	4	5

Laptop	Processor	RAM	Graphics Memory	Screen Size	OS
L1	i5			14"	Windows
L2		16GB			Windows
L3			6GB		
L4			6GB	15"	
L5		8GB		14"	
L6					
L7	i7			14"	

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

- For which of the following parameters do L2 and L6 not share the same specification?
(A) Graphics Memory (B) RAM
(C) Processor (D) Screen Size
- Which of the following options denote the Processor and Graphics Memory of L5 (taken in that order)?
(A) i5, 8GB (B) i7, 8GB
(C) i5, 6GB (D) i7, 6GB
- How many laptops have 6GB Graphics Memory and 8GB RAM?
(A) 1 (B) 2
(C) 0 (D) More than 2
- Which of the following statements is true?
I. All the laptops with Screen Size of 14" have Graphics Memory of 8GB.
II. All the laptops with 16GB RAM have Windows OS.
III. All the laptops with Graphics Memory of 8GB have Screen Size of 14".
(A) Only I and II (B) Only II
(C) I, II and III (D) Only II and III

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

A container, in the shape of a cube, is used for mixing paints in a factory. On each face of the container, a

code, in the form of a two-digit number, is written. The paints that need mixing are injected into the container through a small hole, which is then sealed. The container is then placed in a machine which grips the top and bottom faces of the container and spins the container a few times from left to right, stopping intermittently. In the second round of mixing, the container is removed and fixed again in the machine such that the top and bottom faces are different from the previous round. The machine again spins the container, from left to right, stopping intermittently. Many such rounds of mixing happen until the paints are thoroughly mixed.

Rajesh was observing this process from the factory floor and, in each round, whenever the machine stopped spinning the container, he noted down the code written on one of the faces of the container that was visible to him. During any round, the top and bottom faces of the container are not visible to Rajesh.

The following table provides the numbers that he noted down during different rounds of mixing:

Round	Code
Round 1	23, 54, 54, 23, 81, 81
Round 2	45, 23, 23, 45, 76, 76
Round 3	45, 45, 91, 91, 81, 45
Round 4	23, 23, 45, 54, 45, 23

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

5. What is the code on the face which is opposite the face which has a code of 81?
(A) 23 (B) 54 (C) 91 (D) 45
6. Which of the following pairs of codes are on faces which are opposite each other?
(A) 54, 81 (B) 45, 54
(C) 23, 91 (D) 45, 76

7. In how many ways could the codes on the faces of the container have been written?

- (A) 1 (B) 2
(C) 4 (D) 8

8. What is the maximum possible sum of the codes on any two faces adjacent to each other?

- (A) 157
(B) 167
(C) 145
(D) None of the above

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

A company manufactures three models of cars, Optimus, Bumblebee and Wheeljack. In a country, the numbers of units of these three models sold in the year 2018 are in the ratio 3 : 5 : 10, respectively. Each model was sold in one or more of the three states of the country, Iacon, Tarn and Vos. The numbers of units of Bumblebee sold in these three states in the year 2018 are in the ratio 7 : 2 : 4, respectively. In Vos, the numbers of units of the three models sold (in the order specified above) are in the ratio 5 : 3 : 6, respectively.

The following table provides partial information about the number of units of each model sold in each state in the year 2018:

		State		
		Iacon	Tarn	Vos
Model	Optimus	34		
	Bumblebee			
	Wheeljack	150		

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

9. Which of the following statements regarding the number of units of Optimus sold is definitely true?
(A) It is the highest for Vos.
(B) It is the lowest for Iacon.
(C) It is the highest for Tarn.
(D) None of the above
10. Which of the following statements is definitely false?
I. The number of units of Wheeljack sold in Iacon is greater than that sold in Vos.
II. The number of units of Wheeljack sold in Tarn is less than that sold in Vos.
III. The number of units of Wheeljack sold in Vos is less than that sold in Tarn.
IV. The number of units of Wheeljack sold in Iacon is less than that sold in Tarn.
(A) Only II and IV
(B) Only I and II
(C) Only III and IV
(D) None of the above
11. What is the minimum number of units of Bumblebee sold in the three states combined?
(A) 1180 (B) 590 (C) 780 (D) 390
12. If the number of units of Wheeljack sold in Tarn is at least 60% of the total number of units of Wheeljack sold, what is the minimum number of units of Optimus sold in Vos?
(A) 200 (B) 400 (C) 500 (D) 600

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

In a game show, there are n bulbs, each of which can be operated by the press of a button. If a bulb is initially OFF, pressing the button connected to the bulb once, will make the bulb glow Green; pressing it two times, will make the bulb glow Blue; pressing it three times, will make the bulb glow Yellow; pressing it four times, will make the bulb glow Red, while pressing it the fifth time will switch the bulb OFF. This cycle repeats itself for any number of button presses, from the sixth time onwards.

The n bulbs are all present in one room and none of the bulbs is visible from outside this room. The buttons connected to these n bulbs are all in a different room. Gaurav, a participant in the game show, was asked to operate the buttons and try to figure out the respective button connected to each bulb. Every time he enters the room in which the bulbs are present and checks the status of the bulbs, it is counted as one *visit*. The objective of the game is to minimize his number of *visits*.

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

13. If $n = 2048$, what is the minimum number of *visits* required?

14. If n is a multiple of 64 and Gaurav was able to determine the button connected to each bulb in 5 *visits*, what is the maximum possible value of n ?

15. Due to a malfunction in the circuitry, every time a bulb is supposed to be glowing (i.e., not OFF), it does not necessarily glow in the colour that it is supposed to glow in (as per the description above), but glows in any of the four possible colours randomly. However, every fifth time the button is pressed the bulb turns OFF, just as it is supposed to. Gaurav was informed about this malfunction and was asked to figure out the respective buttons connected to each bulb.

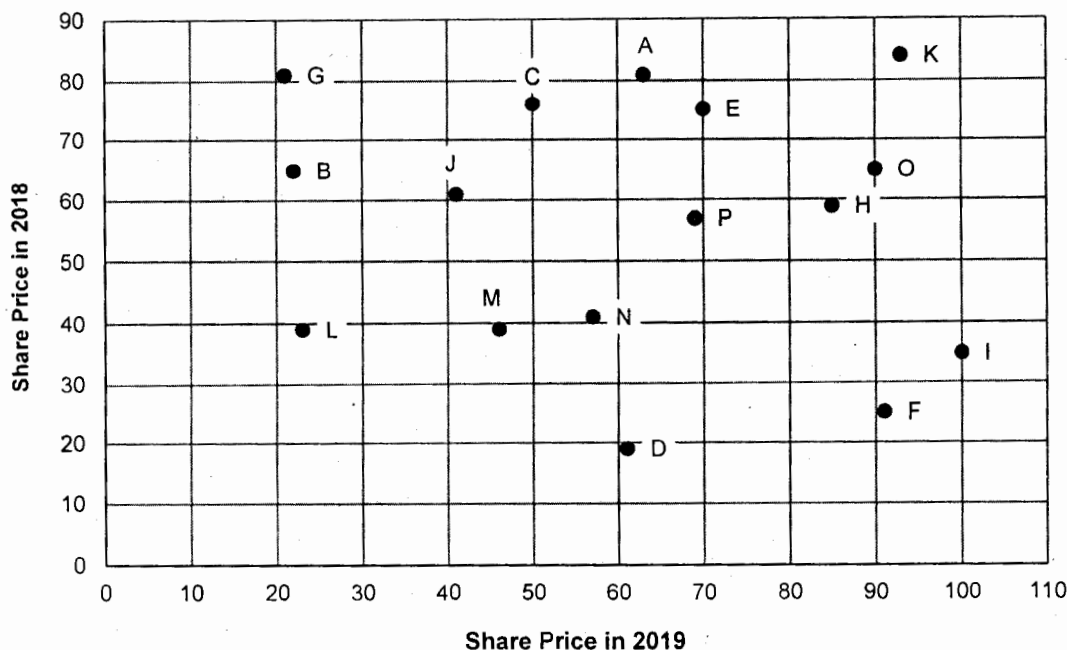
If $n = 48$, what is the minimum number of visits required?

16. Due to a malfunction in the circuitry, every time a bulb is supposed to be glowing (i.e., not OFF), it does not necessarily glow in the colour that it is supposed to glow in (as per the description above), and glows in any colour, which is not necessarily one of the four possible colours. However, every fifth time the button is pressed the bulb turns OFF, just as it is supposed to. Gaurav was informed about this malfunction and was asked to figure out the respective buttons connected to each bulb.

If Gaurav was able to determine the button connected to each bulb in 5 visits, what is the maximum possible value of n ?

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

The scatter plot below provides the price (in ₹) of a share of each of sixteen companies, labelled A through P, at the beginning of 2018 and at the beginning of 2019. At the beginning of 2018, Hari purchased a few shares of some of these sixteen companies and, at the beginning of 2019, sold all the shares that he purchased.



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

17. If Hari purchased the shares of a certain company for ₹1,00,000 and sold all the shares for less than ₹40,000, the shares that he purchased could have belonged to which of the following company?
(A) B (B) L (C) F (D) K

18. Hari purchased a few shares of a certain company in 2018 for ₹ x and sold these shares in 2019 for ₹ y . If the difference between x and y is at most ₹10,000, what is the maximum number of shares that he purchased (approximately)?
(A) 7500 (B) 2000
(C) 5000 (D) 2500

19. In 2018, Hari purchased 1000 shares of each of two companies for a total of ₹1,00,000 and, in 2019, he sold all the shares for more than ₹1,75,000.

What is the maximum amount that he spent on purchasing shares of any company?

- (A) ₹94,000 (B) ₹86,000
(C) ₹60,000 (D) ₹65,000

20. In 2018, Hari purchased 1000 shares of each of two companies for a total of ₹1,00,000 and, in 2019, he sold all the shares for more than ₹1,75,000.

What is the profit percentage that he made in purchasing and selling these shares?

- (A) 75% (B) 80% (C) 90% (D) 110%

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

Six persons, A through F, have a certain number of books among themselves. For any group of persons among the six, the average number of books per person for that group is an integer.

It is also known that

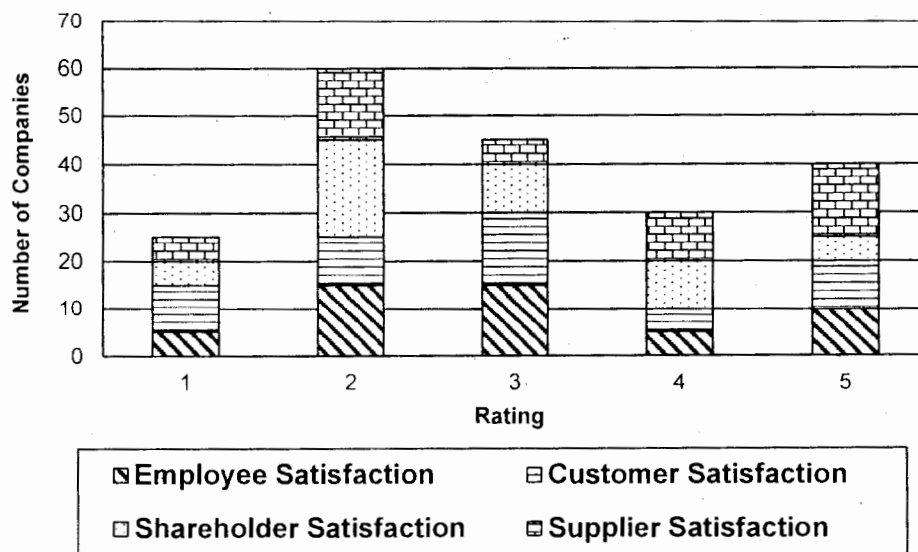
- (i) the total number of books with the six persons is 2700.
- (ii) B has more number of books than C and the difference between the number of books with B and C is between 150 and 200.
- (iii) the number of books with D is the same as the sum of the number of the books with A and E.
- (iv) the number of books with A, F and B are in the ratio 3 : 4 : 5 and no person has more than 800 books.

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

21. What is the number of books with A?
(A) 120 (B) 150 (C) 300 (D) 360
22. What is the difference between the highest number of books with any person and the lowest number of books with any person?
(A) 200 (B) 300 (C) 360 (D) 420
23. What is the third lowest number of books with any person?
(A) 300 (B) 360 (C) 420 (D) 500
24. What is the sum of the number of books with C and E?
(A) 580 (B) 660 (C) 600 (D) 720

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

Uday rated 50 companies, each on a scale of 1 to 5, on four parameters, Employee Satisfaction, Customer Satisfaction, Shareholder Satisfaction and Supplier Satisfaction. The following bar graph provides the number of companies that were given each rating in each parameter:



It is known that

- (i) the rating of any company in Customer Satisfaction was not greater than its rating in Supplier Satisfaction.
- (ii) the rating of any company in Shareholder Satisfaction was not greater than its rating in Employee Satisfaction.

DIRECTIONS for questions 25 to 28: Type in your answer in the input box provided below the question.

25. What is the maximum number of companies which have the same rating in both Shareholder Satisfaction and Employee Satisfaction?

26. What is the maximum number of companies which are rated 2 in Customer Satisfaction, 2 in Supplier Satisfaction, 3 in Employee Satisfaction and 2 in Shareholder Satisfaction?

27. What is the maximum number of companies which have the same rating in all the four parameters?

28. What is the maximum number of companies which have distinct ratings in all the four parameters?

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

Each of six persons, Amit, Karan, Jai, Lokesh, Pavan and Ratan, are standing in a queue, one behind the other, all facing the same direction. Each person has with him a different number of chocolates among 10, 14, 18, 19, 23 and 29.

It is also known that

- (i) for any pair of persons adjacent to each other, the difference between the number of chocolates with the two of them is greater than four.

- (ii) Karan, who is standing behind Amit, has four chocolates more than the number of chocolates with the person standing at the end of the queue.
 (iii) not more than four persons are standing in front of the person with the least number of chocolates.
 (iv) Jai is standing immediately behind Lokesh.
 (v) Pavan, who has five chocolates more than Lokesh, is standing three places away from Amit.

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

29. Who has the highest number of chocolates?
 (A) Jai (B) Pavan (C) Ratan (D) Amit

30. How many chocolates does the person standing at the beginning of the queue have?
 (A) 29 (B) 19 (C) 14 (D) 23

31. What is the total number of chocolates with the last three persons in the queue?
 (A) 60 (B) 62 (C) 52 (D) 55

32. For how many persons is the number of chocolates with them greater than that with any person standing adjacent to them?
 (A) 0 (B) 1 (C) 2 (D) 3

SECTION – III

Number of Questions = 34

DIRECTIONS for questions 1 to 5: Select the correct alternative from the given choices.

- Let $a = (\log_2 x)^2 - 12 \log_2 x + 48$, where x is a real number. The number of distinct roots of $x^a = 16^{16}$ is
 (A) 0. (B) 1. (C) 2. (D) 3.
- If the highest power of 225 in $n!$ is 10, find the number of values that n can assume.
 (A) 0 (B) 3 (C) 5 (D) 10
- Three numbers in geometric progression are such that if 64 is decreased from the largest, then the three numbers thus obtained would be in arithmetic progression. Further if the middle number of the new set of numbers is reduced by 8, the numbers thus obtained would be in geometric progression. Find the middle term of the original sequence.
 (A) 5 (B) 20
 (C) $\frac{52}{9}$ (D) Cannot be determined
- A semicircle, whose centre is O, has a radius of 7 cm. P and Q are the end points of its diameter. Now, if three points, R, S and T are selected on it such that $PR = RS = ST = TQ$, find the area of the pentagon POTSR (in sq.cm)
 (A) $\frac{147\sqrt{2}}{4}$ (B) $\frac{147\sqrt{2}}{6}$
 (C) $\frac{294\sqrt{2}}{4}$ (D) $\frac{147\sqrt{2}}{2}$
- Ten years ago, Amar's age was one-third of Balu's age and half of Chiru's age. If ten years from now, Amar's age will be half of Balu's age and two-thirds of Chiru's age, how old is Chiru now?
 (A) 30 years (B) 40 years
 (C) 50 years (D) 60 years

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

6. Neha takes a loan at 20% p.a. with interest being compounded annually. The loan is to be repaid in ten equal annual instalments of ₹7,200 each. After paying the eighth instalment (at the end of the eighth year), the rate of interest was reduced to 10% for the ninth and tenth years. Now, if Neha wants to repay the remaining loan (along with the interest) in

a single payment at the end of the ninth year, what is the amount (in ₹) that she must pay?

DIRECTIONS for question 7: Select the correct alternative from the given choices.

7. If an eight-digit number with distinct digits has exactly three odd digits and is divisible by all the non-zero digits in it, then which of the following cannot be a digit of the number?
 (A) 3 (B) 7 (C) 1 (D) 5

DIRECTIONS for question 8: Type in your answer in the input box provided below the question.

8. Three men, John, Jack, and Joe, run around a circular track, starting at the same time and at the same point, with constant speeds of 8 kmph, 10 kmph, and 15 kmph respectively. John and Jack run in the same direction, whereas Joe runs in the opposite direction. If John and Jack meet each other for the first time after 15 minutes, how long (in minutes) will it take for all three of them to meet for the first time?

DIRECTIONS for question 9: Select the correct alternative from the given choices.

9. For three distinct positive real numbers a, b and c , let
 $f(a, b, c) = \max [\min(a, b), \min(b, c), \min(c, a)]$
 $g(a, b, c) = \min [\max(a, b), \max(b, c), \max(c, a)]$
 $h(a, b, c) = \max [\max(a, b), \max(b, c), \max(c, a)]$
 $p(a, b, c) = \min [\max(a, b), \max(b, c), \max(c, a)]$
 $q(a, b, c) = \max(a, b, c)$ and
 $r(a, b, c) = \min(a, b, c)$
 Which of the following expressions is necessarily less than 1?
 (A) $\frac{q(a, b, c)}{r(a, b, c)}$
 (B) $\frac{[q(a, b, c) - g(a, b, c)]}{p(a, b, c)}$
 (C) $\frac{p(a, b, c)}{h(a, b, c)}$
 (D) $\frac{[g(a, b, c) + p(a, b, c)]}{q(a, b, c)}$

DIRECTIONS for question 10: Type in your answer in the input box provided in the question.

10. If $(14 - a)^{1/3} + (14 + a)^{1/3} = 4$, then the product of the roots of the equation is .

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

11. A, B and C are three points on a circle with centre O, such that $\angle OAC = \angle ABC$. If $AB = 24\sqrt{2}$ cm and $AC = 24$ cm, find the length of BC.
 (A) $12\sqrt{2}$ cm (B) $12\sqrt{3}$ cm
 (C) $2\sqrt{2}$ cm (D) 24 cm
12. The number of positive integers n , satisfying $n^3 - 16n - 4n^2 + 64 \leq 0$ is
 (A) 2. (B) 0.
 (C) 1. (D) More than 2.

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

13. Let y be a five-digit number with exactly four digits being same. If y is also a multiple of 3, how many such numbers are possible?

17. If $M = 30! \left(\frac{1}{30!} + \frac{1}{29!} + \frac{1}{28!2!} + \frac{1}{27!3!} + \dots + \frac{1}{3!27!} + \frac{1}{2!28!} + \frac{1}{1!29!} + \frac{1}{30!} \right)$, find the quotient when $M - 1$ is divided by 1023.
 (A) $2^{20} - 1$ (B) $2^{20} - 2^{10} + 1$ (C) $2^{20} + 1$ (D) $2^{20} + 2^{10} + 1$

18. An alloy, P, is formed by mixing copper and nickel in the ratio of 2 : 3, by weight, while another alloy, Q, is formed by mixing nickel and zinc in the ratio of 4 : 5, by weight. If a third alloy, R, is formed by mixing P and Q, such that the ratio of copper and zinc in R is 5 : 9, by weight, then what fraction, by weight, of the alloy R is nickel?
 (A) $\frac{21}{47}$
 (B) $\frac{20}{41}$
 (C) $\frac{21}{41}$
 (D) None of the above

DIRECTIONS for question 19: Type in your answer in the input box provided below the question.

19. A frog in a well, 300 feet deep, climbs the well in the following manner. On the first day, it climbs one foot. On the second day, it climbs two feet and on the third day it climbs three feet and so on. But every night, it slips down half of the distance that it climbed during the corresponding day. On which day will the frog climb out of the well?

DIRECTIONS for questions 14 to 18: Select the correct alternative from the given choices.

14. If the reciprocal of the sum of the reciprocals of the roots of a quadratic equation $ax^2 + bx + c = 0$ equals the reciprocal of the square of the sum of its roots, then which of the following conclusions holds true?
 (A) a, b and c are in arithmetic progression.
 (B) b, a and $-c$ are in arithmetic progression.
 (C) b, a and $-c$ are in geometric progression.
 (D) $a, c, -b$ are in geometric progression.
15. P and Q can complete a job in 30 days and 20 days respectively. If P started the work first and 15 days later, Q joined, in how many days will they complete the remaining work?
 (A) 6 days
 (B) 12 days
 (C) 18 days
 (D) 21 days
16. If the equations of the two tangents drawn to a circle C from a point P are $4x + 3y - 7 = 0$ and $3x - 4y + 1 = 0$, then the centre of the circle C will definitely lie on the pair of straight lines represented by
 (A) $(x + 6y - 7)(6x + y - 7) = 0$.
 (B) $(x + 7y - 8)(7x - y - 6) = 0$.
 (C) $(x - 6y + 5)(6x + y - 7) = 0$.
 (D) $(x - 7y + 6)(7x + y - 8) = 0$.

DIRECTIONS for questions 20 and 21: Select the correct alternative from the given choices.

20. A positive number N is divided into two unequal parts such that the difference of the cubes of the two parts is 133 times their difference. If the product of the two parts is 36, then what is the value of N?
 (A) 12 (B) 13 (C) 15 (D) 20
21. A permutation is an ordered arrangement of two or more objects. The interchange of any two adjacent objects in a permutation is called a *transposition*. Thus, for three objects a, b and c , the permutation acb can be obtained from the permutation abc using one *transposition*.

How many *transpositions* are needed to completely reverse the permutation $abcdef$, to obtain the permutation $fedcba$?

- (A) 15 (B) 21 (C) 6 (D) 18

DIRECTIONS for questions 22 and 23: Type in your answer in the input box provided below the question.

22. If $xy^2z^3 = 2^{12} 3^2$, where x, y and z are positive real numbers, then find the minimum value of $3x + 2y + z$.

23. Two friends, Turbo and Black Shadow, simultaneously left two places A and B respectively. Turbo left from A, for B, and Black Shadow left from B, for A. However, every time that either of them arrives at his destination, he immediately turns back to reach his starting point and then keeps on travelling in that manner between A and B. If the distance between A and B is 7 km and the speeds of Turbo and Black Shadow are 70 kmph and 20 kmph respectively, how many times do they meet in the first seven hours after they start?

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

24. The sides AB, BC and CA of a triangle ABC are 8, 6 and 4 respectively and the incircle of triangle ABC touches the sides AB, BC and CA at P, Q and R respectively. What is the ratio of the lengths of AP and CR?
- (A) 1 : 3 (B) 3 : 1 (C) 2 : 3 (D) 3 : 2

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

25. If x, y, z are positive integers, such that $xy + x + y = 215$, $yz + y + z = 161$ and $zx + z + x = 107$, then $(y - z)/(x - z) =$

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

26. A circle of radius $\frac{\pi}{2}$ units, centered at the origin, is divided by the curve $y = \tan x$ into two parts, one below the other. The area (in sq. units) of the lower parts is
- (A) $\frac{\pi^3}{8}$ (B) $\frac{\pi^3}{4}$ (C) $\frac{\pi^2}{8}$ (D) $\frac{\pi^2}{4}$

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

27. A cuboid of dimensions 4 cm \times 5 cm \times 6 cm is constructed from identical cubes, each of side 1 cm. The cuboid is then placed on a table, resting on one of its 6 cm \times 4 cm face. Now, two vertical cuts are made (down the height), one cut along each of the two diagonals of the top face. What is the total number of unit cubes which are not affected by the cuts?

DIRECTIONS for questions 28 to 34: Select the correct alternative from the given choices.

28. Rakesh purchased a pen and a book for ₹53. The next day, he returned the book and got a full refund, with which he purchased 6 pencils and also got back a change of ₹21. If the price of a pen is twice that of a pencil, then the number of pens that he can purchase with the change that he got is at most
- (A) 0 (B) 1 (C) 2 (D) 3

29. Two points A and B are taken on one of the perpendicular sides of a right angled triangle MNO, right angled at O, such that OA = 4 cm and OB = 10 cm. A circle is then drawn such that it passes through the points A and B and touches the other perpendicular side of the triangle. What is the radius of the circle?
- (A) 10 cm (B) 7 cm (C) 6 cm (D) 5 cm

30. Among four men, P, Q, R and S, P takes thrice as much time as Q to complete a piece of work. Q takes thrice as much time as R, while R takes thrice as much time as S to complete the same work. One group of three of the four men can complete the work in 13 days, while another group of three can do so in 31 days. Which is the group that takes 13 days?
- (A) P, Q, S (B) Q, R, S
(C) P, R, S (D) P, Q, R

31. There are some baskets labelled 1, 2, 3, 4 and so on upto $2n$, where $n > 6$, such that, for $k = 1, 2, 3, 4, \dots, 2n$, there are exactly k baskets labelled k .

Now, consider the following two cases for the number of apples a_i in the basket labelled i .

Case I : $a_i = i + 1$, if i is odd.
 $= i + 2$, if i is even.

Case II : $a_i = i + 2$, if i is odd.
 $= i + 1$, if i is even.

If the total number of baskets is N , then find the difference between the total number of apples in the N baskets in Case I and Case II.

- (A) 1 (B) $\frac{\sqrt{8N+1}-1}{4}$
(C) $\frac{N(N-1)}{6}$ (D) $\frac{N-4}{8}$

32. What is the sum of the series $3 + 33 + 333 + \dots$ to m terms?

- (A) $\frac{8 \times 10^m + 10 - 9m}{27}$
(B) $\frac{8 \times 10^{m+1} + 27 - 9m}{27}$
(C) $\frac{8 \times 10^{m-1} - 27 - 9m}{27}$
(D) $\frac{10^{m+1} - 10 - 9m}{27}$

33. If $N = \frac{2}{1} \times \frac{4}{3} \times \dots \times \frac{400}{399}$, then N must lie between
- (A) 50 and 60. (B) 20 and 30.
(C) 30 and 40. (D) 40 and 50.

34. The strength of Delhi Public School (D.P.S) is double that of Mumbai Public School (M.P.S). The ratio of the number of boys in class X to the total strength of class X of D.P.S. is 3 : 5 and the same for M.P.S. is 3 : 4. The girls of class X form 2% of the total school strength, both in D.P.S as well as M.P.S. If all the students of class X of both the schools are grouped together, what will be the ratio of girls to boys in the group formed?
- (A) 1 : 3 (B) 1 : 2
(C) 3 : 1 (D) Data insufficient

