

**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.

...Just as Francis Fukuyama claimed in 1989 that history had ended – meaning not that nothing more would ever happen, only that all 'viable systematic alternatives to Western liberalism' had been exhausted – so too some philosophers claim that art as a practice will continue, but it has no more ways of progressing. Two of the more prominent philosophers to have made this sort of argument were G W F Hegel in the early 19th century, and Arthur Danto in the late 20th century...

...What do philosophers mean when they say art has or will come to an end? ...Danto drew attention to two different kinds of endings. We might claim that a narrative has ended; or we might say that a chronicle has ended. This is an important distinction. A narrative has a kind of structure – for example...a story about how I solved a certain problem; and once the problem was solved, the story ends. A chronicle, by contrast, is just a series of events, with no structure – the events simply follow one after the other. ...A chronicle ends only with the disappearance of the thing we are describing.

For Hegel, and Danto, art's narrative had ended; it had progressed as far as it could in solving the task it had set itself. But art's chronicle would never end: there would be new artworks for just as long as there were human beings to create them. Art's end, in this sense, was a good thing. Art was released from labouring away at a task (given by the narrative); it was now free to be anything...

For art to end, then, is for art to be released. Art no longer had to grind away at solving a task. But this still leaves the unanswered question: what does it mean for art to have a task? Hegel's answer to this question is complex. Its central motor is the claim that human life, including human culture, is underwritten by a collective principle of self-consciousness, known as Geist, a notoriously tricky German term, most often rendered as 'mind' or 'spirit'. It is Geist's task ...to refine and complete its awareness of its own freedom, and its awareness of itself. The more this process of refinement progressed, the more abstract and conceptual it became. In the historical period that Hegel roughly identified with Ancient Greece, this self-awareness could find perfect embodiment in 'classical art' ... However, as this self-awareness became more complex and abstract, it developed beyond art's capacities for expression. Consequently, art could no longer push forwards the development of Geist. This task fell to the more discursive and conceptually complex spheres of religion and philosophy ... Art, as a means of eliciting progress in the task of articulating Geist and its self-consciousness, became superseded, and no longer of use in this task.

... But the idea that art is perhaps best understood as a practice exhibiting a narrative survives as a genuinely interesting idea...Danto's claim was that art's first task – the first narrative it worked through – was the perfection of verisimilitude; of producing images that presented an exact likeness of their objects...[However] the camera obscura was later a key technological advancement, in allowing rudimentary reference photographs to be taken ...The camera obscura, of course, soon became the photographic camera, which could record virtually perfect likenesses of objects. Art's innermost goal – its narrative of perfecting representations of objects – had been usurped. It now fell to art, in Danto's view, to focus on a new question: 'What is art?'

1. All of the following subscribe to Danto's definition of a narrative EXCEPT:
  - (A) a movie about how a group of superheroes succeed in bringing back their dead friends killed by an eccentric rationalist.
  - (B) the account of a serial killer who transforms into a vigilante and starts eliminating criminals escaping the law.
  - (C) the remarkable tale of how an investment banker escapes from one of the toughest prisons in the country after planning the escape for years.
  - (D) the story of how a brilliant woman helps two reckless and rather unimaginative guys defeat a homophobic and xenophobic psychopath.
2. Hegel's answer to what it means for art to have a task is that:
  - (A) art motivates self-consciousness in human life.
  - (B) art expresses Geist.
  - (C) art perfects verisimilitude.
  - (D) art prepares humans for religion.
3. The author explains that 'Art's innermost goal... had been usurped' because:
  - (A) the photographic camera evolved to perform art's task.
  - (B) art couldn't perfect likenesses of objects the way a camera did.
  - (C) art was assigned the task of refining Geist.
  - (D) an answer to the question of what art is, wasn't found.
4. Art was superseded in the task of articulating Geist because:
  - (A) Hegel's idea of art clashed with Danto's claim of what art's purpose was.
  - (B) self-awareness became too abstract for art to convey it.
  - (C) self-awareness found its perfect embodiment in 'classical art'.
  - (D) religion and philosophy evolved in their abilities to express self-awareness.
5. According to the author, art's end was a good thing – as explained in the third para – because:
  - (A) art as a narrative is not as effective as art as a chronicle.
  - (B) art is not joyful when it is labouring away at a task.
  - (C) art could be free to take any form.
  - (D) because it would allow new artworks to be created for just as long as there were human beings to create them.

**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.

...The argument ... [that rising inequality in the Anglo-American world must eventually threaten the foundations of democracy] channels a time-worn view, held by thinkers from Karl Marx to Friedrich Hayek, that democracy and capitalism may prove incompatible.

...[T]he past century or so tells a different story. ... Since the dawn of industrialisation, no advanced capitalist democracy has fallen out of the ranks of high-income countries or regressed permanently into authoritarianism. This is not a coincidence, say Torben Iversen of Harvard University and David Soskice of the London School of Economics, in their recent book, "Democracy and Prosperity". Rather, they write, in advanced economies, democracy and capitalism tend to reinforce each other...

Economists and political theorists have imagined all sorts of ways capitalist democracies might fail. The oldest is the worry that grasping masses will vote to expropriate the wealth of entrepreneurs and landowners — and without secure property rights there can be no capitalism. Hayek thought that the governments of the early 20th century, in responding to the concerns of the masses, had over-centralised economic decision-making, a road that led eventually to totalitarianism. ... Joseph Schumpeter feared that as firms grew more powerful, they might push a country towards corporatism and clientelism, winning monopoly rights that would generate profits they could share with politicians. Mr Piketty and others say that inequality naturally rises in capitalist countries, and that political power becomes concentrated alongside economic power in an unstable way. Other economists, like Dani Rodrik, have argued that full participation in the global economy forces a country to give up a degree of either national sovereignty or democracy. Lowering barriers to trade means harmonising trade and regulatory policies with other countries, for instance, which reduces each government's ability to accommodate domestic preferences.

But if capitalism and democracy are such uneasy bedfellows, what explains their long co-existence in the rich world? Mr Iversen and Mr Soskice see capitalism and democracy as potentially mutually supporting, with three stabilising pillars. One is a strong government, which constrains the power of large firms and labour unions, and ensures competitive markets. Weaker countries find it harder to resist the short-term expediency of securing power by protecting monopolies. The second is a sizeable middle class, forming a political bloc that shares in the prosperity created by a capitalist economy. A bargain is struck in which the state provides mass higher education on generous terms, while encouraging the development of frontier industries that demand skilled workers. Middle-class households thus reckon that economic growth is likely to benefit them and their children. Rising inequality is not a threat to capitalist democracies ... because middle-class voters care little about the poor and do not support broader redistribution that could raise their tax bills.

Providing the education, infrastructure and social safety net that support a prosperous middle class requires substantial tax revenue. For the system to hold, a third pillar is needed: large firms that are not very mobile. ... Though multinationals are adept at shifting production and profits around the world, in a knowledge economy, leading firms

cannot break their connections to networks of skilled individuals like those in London, New York or Silicon Valley. Their complex business plans and frontier technologies require the know-how developed and dispersed through these local networks. That increases the power of the state relative to firms, and allows it to tax and spend...

All of this leaves plenty to be concerned about, however. It hinges on the middle classes feeling confident about the economy...

6. A substantial tax revenue is important for a government to run a capitalist democracy:
  - (A) to limit the power of labour unions and larger firms that could turn into monopolies.
  - (B) to ensure broader redistribution of wealth through various welfare schemes.
  - (C) to provide the middle class the wherewithal to benefit from the economic growth of the country.
  - (D) to keep the masses from revolting against landowners, whose confidence is important for capitalism.
7. Which of the following, if true, invalidates the concern raised by the author about the theory advocated by Mr. Soskice and Mr. Iversen?
  - (A) The middle classes do not have a sound understanding of the fundamental principles of economics.
  - (B) The middle class constitutes less than a quarter of the state's population.
  - (C) The state doesn't have the wherewithal to provide education, infrastructure and the social safety net to support a prosperous middle class.
  - (D) The middle classes will always feel optimistic about a capitalist economy run by a strong government.
8. All of the following are ways in which capitalist democracies might fail EXCEPT:
  - (A) Powerful companies might influence policymakers and grasp more power.
  - (B) Inequality bred by capitalism leads to political instability.
  - (C) The masses wielding voting powers make property-owners insecure.
  - (D) A capitalist democracy in addressing the concerns of the masses risks becoming autocratic.
9. The concern raised by economists such as Dani Rodrik about the functioning of capitalist democracies is weakened by which of the following?
  - (A) Participation in the global economy, in the long run, accommodates domestic preferences.
  - (B) Governments which ignore domestic preferences get voted out irrespective of the country's economic health.
  - (C) Trade barriers raised to keep the local populace happy affect a country's economic growth adversely.
  - (D) Accommodating domestic preferences doesn't help a country's growth in the long run.
10. Large firms that are not nimble are important for the stability of a capitalist democracy because:
  - (A) they make the markets competitive.
  - (B) they create jobs that share the state's prosperity with the citizens.
  - (C) they push a country towards corporatism and clientelism.
  - (D) they guarantee taxes that allow the government to spend on education and infrastructure.

**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.

The much-celebrated successes of the green revolution created a sense among the Indian elite that the threat of an uncertain monsoon had receded. In an essay on the monsoon in Indian literature, the writer and newspaper editor Khushwant Singh in 1987 cited a range of epics and poetry to show how deeply the monsoon had shaped Indian cultural sensibilities over hundreds of years. Singh concluded that, in recent decades, 'India has taken enormous strides toward freeing herself from dependence on the vagaries of the monsoons...There is no longer the same agony waiting through long summer months of searing heat to catch a glimpse of the first clouds,' he wrote...

At just this moment in the 1980s, climate scientists began to worry about the behaviour of the monsoon. Late-20th-century breakthroughs in tropical meteorology shed new light on the internal variability in the monsoon on multiple timescales, from the quasiperiodic impact of the El Niño Southern Oscillation to the intra-seasonal variations attributed to the Madden-Julian Oscillation. With mounting evidence of anthropogenic climate change, meteorologists turned to the question of how planetary warming would affect the monsoon.

The monsoon responds to changing land and sea-surface temperatures. But it is also affected by transformations on a regional scale. Aerosol emissions are a major culprit – particulate matter from vehicle emissions, crop burning, and domestic cooking fires. The skies over India have the highest concentration of aerosols in the world, especially during the winter months when there is no rain to wash the skies clean. They appear as a giant stain on satellite images, spreading across the Indian Ocean. Scientists have dubbed it the 'brown cloud'...Recent research has suggested that, by affecting the thermal contrast that drives the monsoon season, aerosol emissions have also contributed to a decline in monsoon rainfall...

Consider the dilemmas this raises. The 'brown cloud' is a function of energy poverty in South Asia rather than excess. It is, at least in part, the result of the incomplete combustion of the cheapest, most polluting fuels – the only fuels accessible to the 240 million people in India who live without access to electricity. To reduce aerosol emissions would demand the more equitable distribution of electricity. And unless this can be generated from renewable sources, we must accept that it would in turn increase India's greenhouse gas emissions, mitigating the regional drivers of climate change while contributing to planetary warming. There are no easy solutions.

Over the past 150 years, forest cover over most parts of Asia has declined dramatically. This, too, affects the monsoon. The ecologists of the 19th century, known as 'desiccationists', who equated deforestation with drought, might have misunderstood the mechanisms at work. But it now seems that they were not wrong to believe that changes in the land could affect the rains. The intensification of agricultural production in India, and the use of more water for irrigation, have affected the moisture of the soil, its capacity to absorb or reflect heat. Crops reflect more solar radiation than forests, which tend to absorb it.

We are left with a bitter irony. Through a cascade of unintended consequences, so many of the measures taken to secure India against the vagaries of the monsoon – intensive irrigation, the planting of new crops – have destabilised the monsoon itself...

11. The irony being referred to in the last para of the passage is that:
  - (A) the unpredictability of monsoons has several unintended consequences.
  - (B) addressing the adverse effect of unpredictable monsoons has initiated a vicious cycle.
  - (C) no measures have been taken to secure India despite the vagaries of the monsoon.
  - (D) measures intended to make the monsoons more consistent have impacted it adversely.
12. Which of the following, if true, most undermines the reason for the author to believe that there are no easy solutions to 'the brown cloud' problem?
  - (A) It cannot be solved unless people in South Asia can afford alternative fuels.
  - (B) Electricity is not a climate-friendly alternative to the fuels that cause the brown cloud problem.
  - (C) Greenhouse gas emissions are part of a serious problem which cannot be addressed by simply banning a few fuels.
  - (D) Even electricity generated completely by non-renewable sources is tangibly less harmful for the climate as aerosol emissions.
13. The author mentions 'the desiccationists' to drive home the point that:
  - (A) deforestation has been responsible for change in monsoon patterns.
  - (B) droughts are a consequence of dramatic declines in forest cover.
  - (C) intensive irrigation and planting new crops have had an impact on the rains.
  - (D) crops reflect more solar radiation than forests, which tend to absorb it.
14. Variations in monsoon rainfall cannot be connected to which of the following?
  - (A) El Niño Southern Oscillation
  - (B) Inequitable distribution of electricity in South Asia.
  - (C) Thermal contrast, which drives monsoons, fashioned by the changing nature of soil
  - (D) Poverty in South Asia
15. The author is most likely to approve of which of the following to allay the concerns raised in the passage?
  - (A) Rolling back some of the measures implemented under green revolution
  - (B) Ensuring an optimum balance of shares of land available for agriculture and forest cover
  - (C) Substituting polluting fuels with cheap electricity
  - (D) Planting new crops that are not reliant on water-intensive irrigation

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

In the mid-1990s, Joseph Overton, a researcher at the US think tank, the Mackinac Center for Public Policy, proposed the idea of a 'window' of socially acceptable policies within any given domain. This came to be known as the Overton window of political possibilities. The job of think tanks, Overton proposed, was not directly to advocate particular policies, but to shift the window of possibilities so that previously unthinkable policy ideas – those shocking to the sensibilities of the time – become mainstream and part of the debate.

Overton's insight was that there is little point advocating policies that are publicly unacceptable, since no politician will support them. Efforts are better spent, he argued, in shifting the debate so that such policies seem less radical and become more likely to receive support from sympathetic politicians.

Overton was concerned with the activities of think tanks, but philosophers and practical ethicists might gain something from considering the Overton window. By its nature, practical ethics typically addresses controversial, politically sensitive topics. It is the job of philosophers to engage in 'conceptual hygiene' or, as the late British philosopher Mary Midgley described it, 'philosophical plumbing': clarifying and streamlining, diagnosing unjustified assertions and pointing out circularities.

...[T]he freedom to test the limits of argumentation and intuition is vital to philosophical practice. There are sufficient and familiar examples of historical orthodoxies that have been overturned – women's right to vote; the abolition of slavery; the decriminalisation of same-sex relationships – to establish that strength and pervasiveness of a belief indicate neither truth nor immutability.

...Genuine attempts to resolve difficult ethical dilemmas must recognise that understanding develops by getting things wrong and having this pointed out. Most science fails to predict how the world works with perfect accuracy. But as a collective enterprise, it can identify errors and gradually approximate 'truth'. Ethical truths are less easy to come by, and a different methodology is required ... But part of this model requires allowing plenty of room to get things wrong.

It is unfortunate but true that bad ideas are sometimes undermined by bad reasoning. Sometimes those who espouse offensive and largely false views can say true things. Consider the 'born this way' argument, which endorses the flawed assumption that a genetic basis for homosexuality indicates the permissibility of same-sex relationships. While this might win over some individuals, it could cause problems down the line if it turns out that homosexuality isn't genetically determined. Debates relating to the 'culture wars' on college campuses have attracted many *ad hominem* criticisms that set out to discredit the authors' position by pointing to the fact that they fit a certain demographic (white, middle-class, male) or share some view with a villainous figure, and thus are not fit to contribute. The point of philosophy is to identify such illegitimate moves, and to keep the argument on topic; sometimes, this requires coming to the defence of bad ideas or villainous characters...

Widening the Overton window can yield opportunities for ideas that many find offensive, and straightforwardly mistaken, as well as for ideas that are well-defended and reasonable. It is understandable that those with deep personal involvement in these debates often want to narrow the window and push it in the direction of those views they find unthreatening. But philosophers have a professional duty, as conceptual plumbers, to keep the whole system in good working order...

16. The author mentions examples of historical orthodoxies to elucidate that:
  - (A) philosophers must work outside the limits of argumentation and intuition.
  - (B) one can resolve ethical dilemmas only with the understanding developed by being wrong.
  - (C) historical wrongs can be corrected only through perseverance.
  - (D) a prevailing and ubiquitous attitude need not necessarily be right or incontrovertible.
17. According to the author, 'conceptual hygiene' and 'philosophical plumbing' help in all of the following EXCEPT in:
  - (A) bringing into the purview of ethical discussions a much wider spectrum of ideas.
  - (B) repressing incendiary or socially radical topics to gain sympathy from politicians.
  - (C) weeding out fallacious assumptions and reasoning used in ethical arguments.
  - (D) endorsing unpopular but not unreasonable opinions voiced by those vulnerable to *ad hominem* attacks.
18. It is important to allow 'plenty of room' for ethical discussions because:
  - (A) no science can make predictions about the world accurately.
  - (B) rectification helps deepen insights needed to settle ethical dilemmas.
  - (C) ethical truths cannot be approximated as easily as scientific truths.
  - (D) narrowing of the Overton window strengthens a myopic point of view.
19. The author's main contention about the 'born this way' argument is that:
  - (A) it enhances the permissibility of same-sex relationships.
  - (B) it wins over some individuals by connecting the homosexuality debate with genes.
  - (C) its fallibility could weaken the argument of those in favour of same-sex relationships.
  - (D) it endorses a bad idea with largely false views.
20. The depth of the author's main argument in the passage will be enhanced by a study that:
  - (A) demonstrates that most of the epoch-defining breakthrough ideas were originally considered offensive or impractical.
  - (B) shows that students of philosophy have more empathy and a better understanding of ethical issues.
  - (C) highlights that the more personally invested a person is in a debate, the less likely he or she is to concede ground to an alternative view.
  - (D) proves that practical ethicists haven't been given much scope to air their support for logically sound unpopular opinions.

**DIRECTIONS** for questions 21 to 24: The passage given below is accompanied by a set of four questions. Choose the best answer to each question.

The widespread use of antibiotics encourages the pathogens they are directed against to become inured to their effects. That is well known. Some pathogens develop the ability to inactivate the antibiotic before it can do harm. Others can rapidly pump the antibiotic out of bacterial cells. Still others can change the place in the cell that antibiotics target so that the drugs are ineffective.

But antibiotics cause damage to non-target species as well, so these, too, tend to evolve immunity. Since most antibiotics are administered by mouth, the many bacteria that live peacefully in the human gut are particularly susceptible to such evolutionary pressures.

The medical consequences of this are ill-understood, because most gut bacteria are anaerobes [flourishing only in the absence of oxygen] and hence difficult to culture. But Lisa Maier of the European Molecular Biology Laboratory, in Heidelberg, and her colleagues have grown 40 strains in anaerobic conditions. They then exposed those cultures to hundreds of drugs for a range of ailments. Their study, published in *Nature*, reveals a way gut bacteria become resistant to antibiotics: exposure to drugs that were designed to act on human cells rather than microbial ones.

Of the drugs in the study, 156 were antibacterials (144 antibiotics and 12 antiseptics). But a further 835, such as painkillers and blood-pressure pills, were not intended to harm bacteria. Yet almost a quarter (203) did. These accidental bactericides included proton-pump inhibitors such as omeprazole (used to treat acid reflux), calcium-channel blockers (to lower blood pressure), antihistamines, painkillers and antipsychotics. In the case of antipsychotics, these chemically diverse drugs affect many of the same strains of gut bacteria.

The researchers noticed too that the strains of bacteria most resistant to the effects of drugs not aimed at them were also those most resistant to antibiotics. ....To check if that was indeed the case, Dr Maier and her colleagues first looked at a particular strain of a common gut bacterium, *Escherichia coli*, which they knew carried an antibiotic-resistance gene called *tolC*. Bacteria that possess *tolC* can make a protein that works as an antibiotic-expulsion pump. The researchers found that *E. Coli* carrying *tolC* were resistant to the effects of both antibiotic and non-antibiotic drugs, and that *E. Coli* engineered to lack it became susceptible to both.

The team then conducted a foray through the genome of *E. coli*, intended to look at the protective effects of every gene the bug possesses. They bought a library of 4,000 *E. Coli* strains, each of which was engineered to overproduce the protein encoded in one particular gene, different for each strain. They studied the effects of seven non-antibiotic drugs on each of these strains.

They found many cases where proteins (and thus genes) which protected bacteria from these seven drugs were ones already known to make them resistant to antibiotics. In sum, their work suggests that bacteria often use similar mechanisms to evade all classes of drugs. These protective mechanisms can be spread by the bacterial habit of trading DNA not only with conspecifics but also with other members of the bacterial domain. The more these resistant organisms spread, the more they add to the pool of resistance genes in all bacteria, raising the odds that these genes will jump to more disease-causing microbes by horizontal gene transfer. That is worrisome. Drug-resistant infections could, by some estimates, become responsible for 10m deaths a year by 2050, up from 700,000 today.

21. It can be inferred from the passage that the findings of the experiments conducted by Dr Lisa Maier served to chiefly

- (A) dispel the notion that gut bacteria, being anaerobes, are difficult to culture.
- (B) highlight that every type of bacteria has become less responsive to the antibiotic treatment designed to combat it.
- (C) indicate that non-antibiotic drugs promote antibiotic resistance in gut microbes.
- (D) prove that one bacterium acquired antibiotic resistance by acquiring the associated gene from another via horizontal gene transfer.

22. Which of the following correctly represents examples of "accidental bactericides" mentioned in the passage?

- (A) calcium-channel blockers, painkillers, omeprazole, antiseptics, antipsychotics
- (B) antihistamines, calcium-channel blockers, antipsychotics, proton-pump inhibitors, painkillers
- (C) blood-pressure pills, omeprazole, antipsychotics, antimicrobial agents, antihistamines
- (D) painkillers, antibiotic-expulsion pump proteins, antihistamines, proton-pump inhibitors, calcium-channel blockers

23. Which of the following, if true, best exemplifies "These protective mechanisms can be spread by the bacterial habit of trading DNA ..... bacterial domain" mentioned in the penultimate para?

- (A) To resist antibiotic and non-antibiotic drugs, gut bacteria use similar mechanisms such as expulsion of drugs via efflux pumps, or inactivation of proteins.
- (B) The effects of antipsychotics and painkillers on the brain could, in part, be a result of their primary influence on gut flora.
- (C) Antibiotics remove drug-sensitive competitors, leaving resistant bacteria behind to reproduce as a result of natural selection.
- (D) The gut bacteria of patients consuming painkillers or proton-pump inhibitors evolve a resistance which is passed onto other pathogens attacking the body.

24. Which of the following additional studies can serve to alleviate that which the author calls "worrisome" in the last para of the passage?

- (A) Studies showing that the gut bacteria seldom came into contact with the disease-causing bacteria.
- (B) Studies focussing on assessing the impact of the gut bacteria of patients consuming accidental bactericides on pathogens that subsequently infected the body.
- (C) Epidemiological studies linking antibiotic consumption and the dissemination of resistant bacterial strains.
- (D) Subtherapeutic studies linking high antibiotic concentrations in the gut to antibiotic resistance via horizontal gene transfer, mutagenesis and changes in gene expression.

**DIRECTIONS for question 25:** Five sentences (labelled 1, 2, 3, 4, 5) are given in the following question. Four of them can be put together to form a meaningful and coherent short paragraph and **one sentence is the odd one out**. Decide on the proper logical order for the sentences and key in the sequence of **four** numbers as your answer, even as you **omit the contextually unrelated sentence**.

25. (1) From the eighth century BC, the Greeks were organised into various independent city-states, known as *poleis*, which spanned the entire Mediterranean region and the Black Sea.
- (2) While Athens has been inhabited for thousands of years, it became the capital of Greece after the country gained independence from the Ottoman Empire in the Greek War of Independence.
- (3) They celebrate Independence Day on March 24 with the annual students' parade and continue the following day with a grand parade that features marching bands and military vehicles.
- (4) Athens is one of the oldest cities in the world and considered the birthplace of democracy, Western philosophy, and the Olympic Games, among other foundational achievements.
- (5) Back then, the city was home to about 4,000 people but today, more than 600,000 people live in Athens, with nearly 4 million in the metro area.

**DIRECTIONS** for question 26: The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.

26. For most of human history we haven't needed to think long-term. It wasn't very useful when we were avoiding attacks from sabre-toothed tigers, desperately foraging for breakfast on the forest floor and surviving extreme weather conditions. As futurist Jamais Casio puts it, "In a world of constant, imminent existential threats, the ability to recognise subtle, long-term processes and multi-generational changes wasn't a particularly important adaptive advantage." Yet today, the nature of risk has changed. We no longer live in a world of clear, local cause and effect, and the greatest threats to civilisation are happening on the timescale of decades or centuries.
- (A) A world of perpetual and impending existential threats has given way to one where threats require us to think long-term.
  - (B) While individual preservation was the priority for the greater part of human history, we must adapt to threats to the whole civilisation.
  - (C) Humans have adapted to deal with immediate threats, but haven't learnt to deal with subtle, multi-generational threats.
  - (D) The threats have changed in nature from those that threatened life to those that threaten the civilisation.

**DIRECTIONS** for question 27: Five sentences (labelled 1, 2, 3, 4, 5) are given in the following question. Four of them can be put together to form a meaningful and coherent short paragraph and **one sentence is the odd one out**. Decide on the proper logical order for the sentences and key in the sequence of **four** numbers as your answer, even as you **omit the contextually unrelated sentence**.

27. (1) And instead of looking to be right all the time, we should be looking for how we're wrong all the time because being wrong opens us up to the possibility of change.
- (2) Instead of striving for certainty, we should be in constant search of doubt: doubt about our own beliefs and principles.
- (3) That's why accepting the inevitable imperfections of our values is necessary for any growth to take place.
- (4) Growth is an endlessly iterative process: when we learn something new, we don't go from "wrong" to "right" but we go from wrong to slightly less wrong.
- (5) Certainty is the enemy of growth: nothing is for certain until it has already happened and even then, it's still debatable.

**DIRECTIONS** for question 28: The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.

28. Perhaps the most dangerous impact of neoliberalism is not the economic crises it has caused, but the political crisis. As the domain of the state is reduced, our ability to change the course of our lives through voting also contracts. Instead,

neoliberal theory asserts, people can exercise choice through spending. But some have more to spend than others: in the great consumer or shareholder democracy, votes are not equally distributed. The result is a disempowerment of the poor and middle. As parties of the right and former left adopt similar neoliberal policies, disempowerment turns to disenfranchisement. Large numbers of people have been shed from politics.

- (A) Neoliberalism lies at the root of disillusionment of some sections of society due to their inability to match the spending power of other sections.
- (B) Neoliberalism interferes with the political system by making some voters more important than the others.
- (C) Neoliberalism has managed to place greater spending power in the hands of some sections of society, thus undermining the value of a democratic system.
- (D) Neoliberalism has marginalised people with lower spending power in the democratic system, by undermining their ability to make a meaningful choice through voting.

**DIRECTIONS** for question 29: The question consists of a paragraph with three blanks. For each blank choose one numbered word/ phrase from the corresponding column of choices that will best complete the text. Key in the appropriate numbers of the words/ phrases for each blank, in the correct sequential order, in the input box given below the question. For example, if you think that words/ phrases labelled (1), (5) and (9) can complete the text correctly, then enter 159 as your answer in the input box. (Note: Only one word/ phrase in each column can fill the respective blank correctly.)

29. The Spanish Civil War provides insight into the changing nature of warfare. Civilians were systematically targeted by aerial bombing and the catastrophic results of such attacks were \_\_\_\_\_ (i) \_\_\_\_\_ in audiovisual media. These changes in the methods of conducting and communicating the effects of war are reflected in the extensive body of poetry written by several foreign authors that allows for the examination of the range of aesthetic paradigms employed to represent the Spanish war in different languages. Such an approach permits the analysis of two tendencies in the representation of air raids: as an aggressive tactic to instill terror, and as a horrific vision of the resulting human \_\_\_\_\_ (ii) \_\_\_\_\_. In both, the civilian victim is represented by the figure of a child: a universal symbol whose death can constitute a sublime image, which is at times as effective as propaganda to legitimate the struggle. The theme of Guernica illustrates the way the images of human destruction function as a/ an \_\_\_\_\_ (iii) \_\_\_\_\_ of a cruelly novel war that foreshadowed disasters beyond Spanish borders.

Blank (i)	Blank (ii)	Blank (iii)
(1) repurposed	(4) carnage	(7) atrocity
(2) publicized	(5) opprobrium	(8) harbinger
(3) blighted	(6) cortege	(9) allegory



**DIRECTIONS for question 30:** Five sentences (labelled 1, 2, 3, 4, 5) are given in the following question. Four of them can be put together to form a meaningful and coherent short paragraph and **one sentence is the odd one out**. Decide on the proper logical order for the sentences and key in the sequence of **four** numbers as your answer, even as you **omit the contextually unrelated sentence**.

30. (1) They are able, really, to handle an unfathomably complex world better than a human can.  
 (2) Algorithms are capable of accomplishing tasks and tackling problems that they've never been able to do before.  
 (3) Each was a complex tangle of instructions and processes, and some were themselves made from sub-algorithmic building blocks.  
 (4) The complexity, dynamism, the sheer not-understandability of the algorithm means that there is a middle part – between input and output – where it is possible that no one knows exactly what they're doing.  
 (5) But exactly because they can, the way they work has become unfathomable too.

**DIRECTIONS for question 31:** The question consists of a paragraph with three blanks. For each blank choose one numbered word/ phrase from the corresponding column of choices that will best complete the text. Key in the appropriate numbers of the words/ phrases for each blank, in the correct sequential order, in the input box given below the question. For example, if you think that words/ phrases labelled (1), (5) and (9) can complete the text correctly, then enter 159 as your answer in the input box. (Note: Only one word/ phrase in each column can fill the respective blank correctly.)

31. A silent film is a film with no synchronized recorded sound (and in particular, no audible dialogue). In silent films for entertainment, the plot may be conveyed by the use of title cards, written indications of the plot and key dialogue lines. The idea of combining motion pictures with recorded sound is \_\_\_\_\_ (i) \_\_\_\_\_ film itself, but because of the technical challenges involved, the introduction of synchronized dialogue became practical only in the late 1920s with the perfection of the Audion amplifier tube and the Vitaphone system. The term "silent film" is \_\_\_\_\_ (ii) \_\_\_\_\_, as these films were almost always accompanied by live sounds. During the silent-film era that existed from the mid-1890s to the late 1920s, a pianist, theater organist or a small orchestra would often play music (to accompany the films) either from sheet music or improvisation. Sometimes a person would narrate the \_\_\_\_\_ (iii) \_\_\_\_\_ cards for the audience. Though at the time the technology to synchronize sound with the video didn't exist, music was seen as an essential part of the viewing experience.

Blank (i)	Blank (ii)	Blank (iii)
(1) as illusory as	(4) a retronym	(7) intertitle
(2) not so exigent as	(5) a misnomer	(8) rendition
(3) nearly as old as	(6) apposite	(9) felicitic

**DIRECTIONS for question 32:** Five sentences (labelled 1, 2, 3, 4, 5) are given in the following question. Four of them can be put together to form a meaningful and coherent short paragraph and **one sentence is the odd one out**. Decide on the proper logical order for the sentences and key in the sequence of **four** numbers as your answer, even as you **omit the contextually unrelated sentence**.

32. (1) It is this philosophical depth that has led many readers to speak of the novel as having changed their lives.  
 (2) Grossman completed *Life and Fate* almost fifteen years after he first started work on *Stalingrad*.  
 (3) Much of this material found its way into *Stalingrad* and it endows the novel with great vitality and a certain democratic quality.  
 (4) *Stalingrad*, in contrast, is less philosophical but more immediate; it presents us with a richer, more varied human story.  
 (5) *Life and Fate* is, among other things, a considered statement of his moral and political philosophy — a meditation on the nature of totalitarianism, the danger presented by even the most seemingly benign of ideologies, and the moral responsibility of each individual for his own actions.

**DIRECTIONS for question 33:** The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.

33. For a long time in the past, it was the rage to remark on the speed with which we were leaving the past behind. Now we happily talk about either how little has changed or that the past persists within or behind the newness of things. We will never be rid of the past. This is surely a fateful way of understanding the past's persistence. But this fate does not have to be bad. Just because we are shadowed by the old does not mean we are its puppets or have no freedom at all. What's more, the idea that the past persists can have a salutary effect. It may soften our fetish for change, turn our fever for forward movement to reticence, relax the continual, tortured desire to "move on." On the other hand, if we admit that the past persists, it does seem unlikely that we will ever achieve total freedom. Accepting this mode of fate ruins the fantasy that we could have no constraints whatever.
- (A) One cannot innovate and renovate and at the same time admit that the past had never actually passed.  
 (B) One is gripped by the discrepancy between the contemporaneity of a person's act and the primordality of his intention and its persistence.  
 (C) Conjuring up the past can be beneficial or onerous, but it is up to us to achieve a life of freedom without any constraints.  
 (D) The past's persistence can have both positive and negative effects but admitting to it limits us in achieving complete freedom.



**DIRECTIONS for question 34:** The question consists of a paragraph with three blanks. For each blank choose one numbered word/ phrase from the corresponding column of choices that will best complete the text. Key in the appropriate numbers of the words/ phrases for each blank, in the correct sequential order, in the input box given below the question. For example, if you think that words/ phrases labelled (1), (5) and (9) can complete the text correctly, then enter 159 as your answer in the input box. (Note: Only one word/ phrase in each column can fill the respective blank correctly.)

34. Every individual is continually exerting himself to find out the most \_\_\_\_\_ (i) \_\_\_\_\_ employment for whatever capital he can command. It is his own advantage, and not that of the society, which he has in view. But the study of his own advantage leads him to prefer that employment which is most advantageous to the society...As every individual endeavours as much as he can both to employ his capital in the support of domestic industry, and so to direct that industry that its produce may be of the greatest value; every individual necessarily labours to render the annual revenue of the society as great as he can. He neither intends to promote the public interest, nor knows how much he is promoting it. By preferring the support of domestic to that of foreign industry, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is led by \_\_\_\_\_ (ii) \_\_\_\_\_ to promote an end which was no part of his intention. Nor is it always the worse for the society that it was no part of it. By pursuing his own interest, he frequently \_\_\_\_\_ (iii) \_\_\_\_\_ that of the society more effectually than when he really intends to promote it.

Blank (i)	Blank (ii)	Blank (iii)
(1) expedient	(4) a wild goose chase	(7) facilitates
(2) detrimental	(5) an invisible hand	(8) jeopardises
(3) insidious	(6) a sense of duty	(9) quells

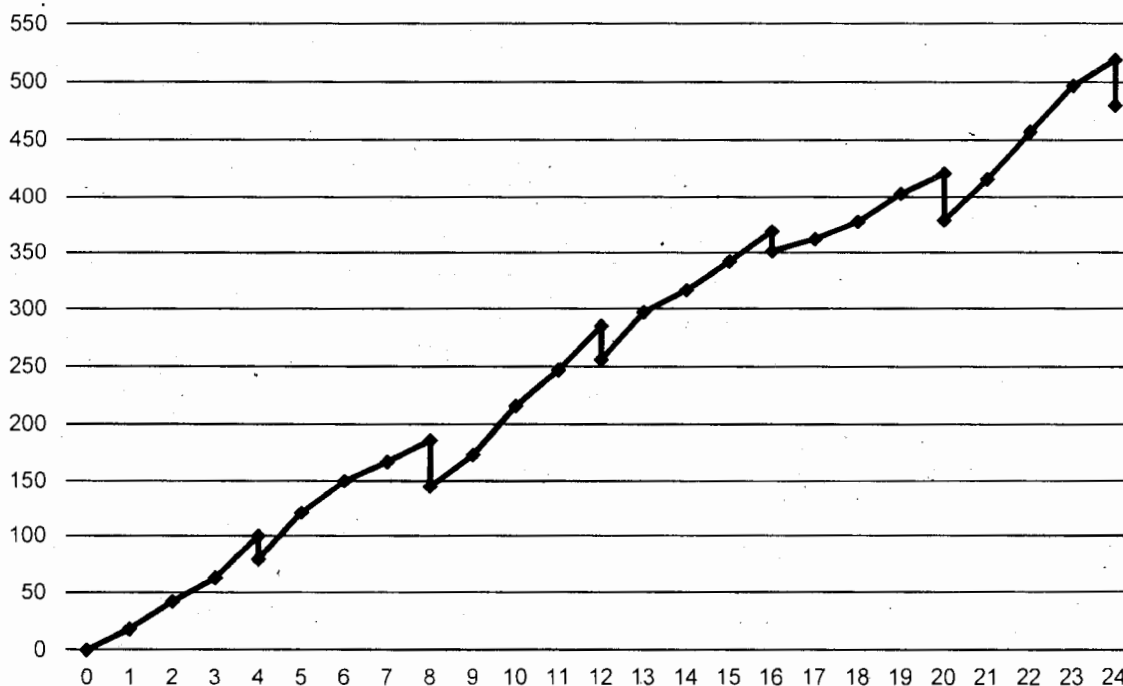
## SECTION – II

Number of Questions = 32

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

In a manufacturing plant, pen drives are manufactured 24 hours a day, without any break. After every four hours, a quality inspector inspects the pen drives that were manufactured in the previous four hours and discards all the defective pieces manufactured in those four hours. The following line chart presents the cumulative number of pen drives manufactured, on an hourly basis, on a particular day (24 hours, from 0:00 to 24:00). The dip in the line at the end of every four hours corresponds to the defective pieces discarded by the quality inspector.

**Cumulative Pen Drives Manufactured**



**DIRECTIONS** for questions 1 to 3: Select the correct alternative from the given choices.

1. During which of the six four-hour periods in the day was the average production of non-defective pen drives per hour the highest?  
(A) 0:00 to 4:00  
(B) 8:00 to 12:00  
(C) 12:00 to 16:00  
(D) 20:00 to 24:00
2. The total number of defective pen drives manufactured as a percentage of the total number of pen drives manufactured during the day is closest to  
(A) 28.97%.  
(B) 27.91%.  
(C) 28.36%.  
(D) 27.31%.
3. What was the average number of defective pen drives manufactured per hour between 8:00 and 18:00?  
(A) 7  
(B) 5  
(C) 9  
(D) Cannot be determined

**DIRECTIONS** for question 4: Type in your answer in the input box provided below the question.

4. If the defect rate of the plant is defined as the average number of defective pen drives manufactured per hour as a percentage of the average number of non-defective pen drives manufactured per hour, what would be the defect rate of the plant for these 24 hours?

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

%

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

Six students – Amar, Bhanu, Chitra, Dev, Eswar and Fatima – wrote an examination which had ten questions in total. A student was awarded one mark for every question he/she answered correctly and was awarded minus (i.e., a penalty of) half a mark for every question he/she answered incorrectly. Also, the students need not necessarily attempt all the questions in the examination since there was no penalty for leaving any question unattempted. Further, it is also known that

- (i) every student attempted at least seven questions and exactly one student answered more than four questions incorrectly.
- (ii) no two students answered the same number of questions correctly but every student answered at least three questions correctly.
- (iii) the number of questions attempted by each of Chitra and Fatima was the same and was less than that by

Amar, who, in turn, answered less number of questions correctly than did Dev.

- (iv) though Bhanu attempted more questions than any other student, Bhanu did not get the highest net marks.
- (v) the number of questions answered incorrectly by Chitra was less than that by each of Amar and Dev.
- (vi) Fatima scored a net of 5.5 marks, whereas Bhanu scored a net of 6 marks.

**DIRECTIONS** for question 5 and 6: Type in your answer in the input box provided below the question.

5. What is the maximum number of questions answered correctly by any of the six students?

6. How many of the six students scored a net of more than five marks in the examination?

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

7. The total of the net marks scored by all the six students in the examination is  
(A) 23.5.  
(B) 26.5.  
(C) 26.  
(D) Either B or C.
8. Among the students who attempted exactly seven questions, the student who scored the highest net marks is  
(A) Fatima.  
(B) Eswar.  
(C) Dev.  
(D) Cannot be determined.

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

The table below represents the runs scored by four batsmen in three matches in a series. The four batsmen Sehwag, Gambhir, Rohit and Dhoni are disguised in the table as Player 1, Player 2, Player 3 and Player 4, in no particular order.

Match	Player 1	Player 2	Player 3	Player 4
Match 1	49	48	45	50
Match 2	50	50	45	44
Match 3	56	34	38	57

Further it is known that,

- (i) In Match 2, Sehwag scored a half century (50 runs).
- (ii) Dhoni scored four runs more than Gambhir in the three matches combined.

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

9. What can be said regarding the following two statements?

Statement 1: In Match 2, Rohit scored the lowest runs among the four.

Statement 2: Gambhir scored more runs than Rohit in the three matches combined.

- (A) If statement 1 is true, then statement 2 is necessarily true.  
(B) If statement 1 is true, then statement 2 is necessarily false.  
(C) Exactly one of the statements is true.  
(D) Both (B) and (C)

10. What can be said regarding the following two statements?

Statement 1: In Match 3, Gambhir scored the highest runs among the four.

Statement 2: Dhoni scored the highest runs among the four in the three matches combined.

- (A) Both statements could be true.  
(B) At least one of the statements must be true.  
(C) Exactly one of the statements must be true.  
(D) At most one of the statements could be true.

11. If in the three matches, Rohit had his lowest score in Match 3, then which of the following statements is definitely true?

- (A) Sehwag had his lowest score in Match 2.  
(B) Sehwag had his lowest score in Match 1.  
(C) Sehwag had his lowest score in Match 3.  
(D) Sehwag scored the highest number of runs, in the three matches combined.

12. What can be said regarding the following two statements?

Statement 1: In the three matches, Gambhir had his lowest score in Match 2.

Statement 2: In the three matches, Dhoni had his lowest score in Match 1.

- (A) If statement 2 is true, then statement 1 is necessarily false.  
(B) If statement 1 is false, then statement 2 is necessarily true.  
(C) If statement 1 is true, then statement 2 is necessarily true.  
(D) Both (A) and (B)

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

Each of five persons, Mani, Viswa, Uday, Rahul and Satish, knows exactly two software languages among C, Java, PHP, Python and Ruby. Each of them now wants to learn a language different from the ones that he already knows, from any of the other persons who already knows that language. The languages that the five persons want to learn are all distinct and each person can teach only one other person. Further, it is also known that

- (i) at least one person knows each language and no two persons know the same set of languages.  
(ii) three people know Java and at most two people know any of the other four languages.  
(iii) both Uday and Satish know Python and one of them teaches Mani.  
(iv) Rahul wants to learn Ruby and only one person knows that language.  
(v) Mani does not know C but wants to learn Java.

**DIRECTIONS** for questions 13 to 16: Select the correct alternative from the given choices.

13. Who wants to learn Python?

- (A) Viswa  
(B) Satish  
(C) Uday  
(D) Cannot be determined

14. If Satish teaches Mani, which language does Uday want to learn?

- (A) Java  
(B) C  
(C) PHP  
(D) Cannot be determined

15. If Rahul knows PHP, then who teaches Uday?

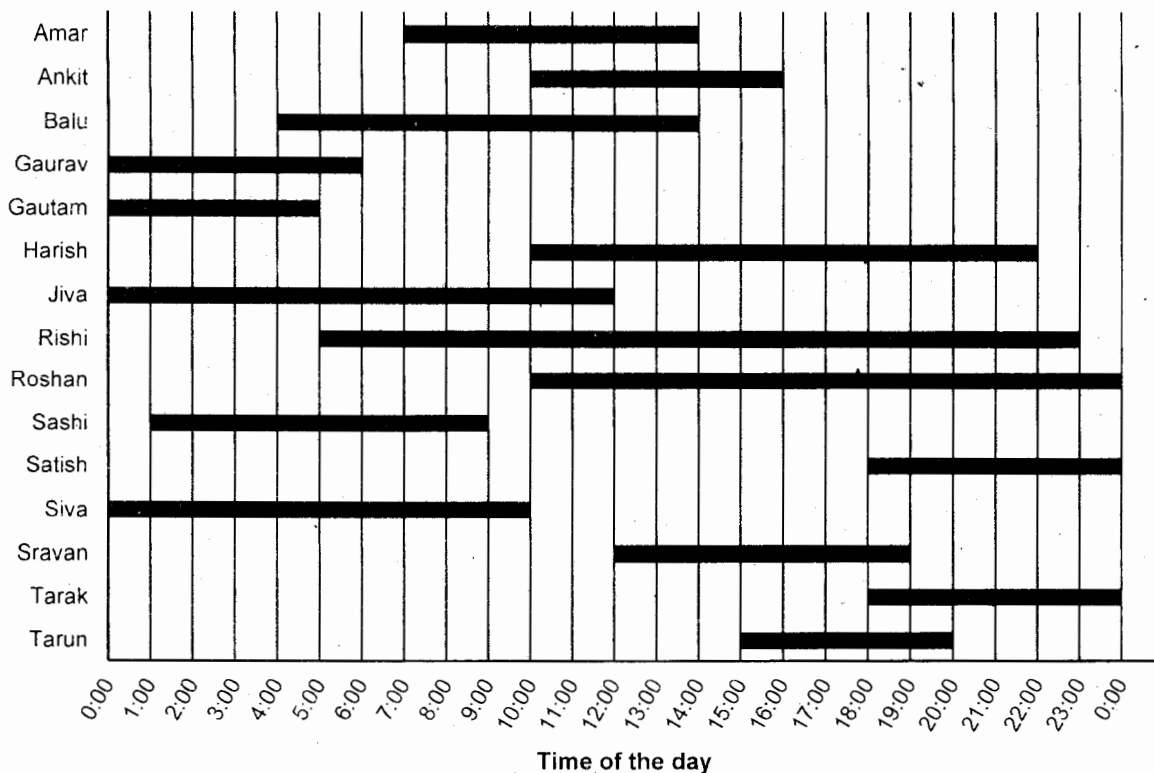
- (A) Rahul  
(B) Satish  
(C) Viswa  
(D) Cannot be determined

16. If Uday teaches Python, which language does Satish want to learn?

- (A) PHP  
(B) C  
(C) Java  
(D) Python

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

The workers in a factory work in shifts, wherein each day is divided into six shifts – Shift I to Shift VI – each of a duration of four hours. The timings of Shift I to Shift VI are 00:00 hrs to 04:00 hrs, 04:00 hrs to 08:00 hrs and so on up to 20:00 hrs to 00:00 hrs respectively. Ranjith, the floor manager in this factory, has to assign exactly three workers to each shift. There are a total of fifteen workers in the factory whom Ranjith can assign to any shift. Each worker can be assigned to multiple shifts but no worker can be assigned to two consecutive shifts. Each worker is available during a different time of the day and can be assigned to any shift only if he is available for the entire duration of the shift. The following graph provides the times (from midnight to midnight) during which the workers are available on a particular day:



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

17. Which of the following sets of workers will work in Shift IV?  
 (A) Sravan, Rishi, Ankit  
 (B) Rishi, Harish, Ankit  
 (C) Sravan, Roshan, Ankit  
 (D) More than one of the above

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

18. How many of the fifteen workers will work for more than one shift?

**DIRECTIONS** for questions 19 and 20: Select the correct alternative from the given choices.

19. Which of the following shifts will be assigned to Rishi?  
 (A) Shift III  
 (B) Shift IV  
 (C) Shift V  
 (D) More than one of the above
20. For which of the following shifts will all the workers assigned to that shift not be assigned to any other shift?  
 (A) Shift I  
 (B) Shift II  
 (C) Shift III  
 (D) Shift IV

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

John was the CEO of Gauss Inc., an electronics company. During the recent past, the company lost several of its client contracts and this became a cause of alarm for him. Therefore, he called a meeting of the senior executives in his company. He scheduled the meeting for 3:00 p.m. and he sent a memo to Albert, Jack, Melinda, William, and Steve, who are the heads of Manufacturing, Strategy, Marketing, Finance, and Human Resources, not necessarily in that order. He was the first to arrive at the Conference Hall, where the meeting was scheduled. The following information is also known about the order in which the rest of them arrived:

- John arrived ten minutes before Jack, the Head of Manufacturing, arrived.
- The Head of Human Resources was the second to arrive and Melinda arrived exactly on time.
- The Head of Marketing was the only person who came late for the meeting.
- Albert arrived exactly five minutes after Jack arrived and five minutes before Melinda arrived.
- The Head of Strategy did not arrive after the Head of Finance.

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

21. At what time did John arrive at the Conference Hall?  
 (A) 2:30 p.m.  
 (B) 2:35 p.m.  
 (C) 2:40 p.m.  
 (D) Cannot be determined

22. Who is the Head of Strategy?

- (A) Albert (B) Melinda  
(C) Steve (D) William

23. If Steve is the Head of Marketing, who was the second person to arrive?

- (A) Albert (B) Melinda  
(C) Jack (D) William

24. Which of the following can be the time at which the Head of Human Resources arrived?

- (A) 2:35 p.m.  
(B) 2:45 p.m.  
(C) 2:55 p.m.  
(D) 2:54 p.m.

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

Shankar, a financial analyst in an investment bank, was calculating the Enterprise Value of seven companies. The Enterprise Value of a company is the sum of the Equity Value and the Debt Value of that company. The Equity Value of a company is calculated as the product of the number of shares of the company and the share price of each share of the company. The following table presents the number of shares, share price and the ratio of Debt Value to Equity Value (D/E ratio) of the company at the beginning and the end of a particular quarter.

Company	Number of Shares (in mn)	Beginning of the Quarter		End of the Quarter	
		Share Price (in ₹)	D/E Ratio	Share Price (in ₹)	D/E Ratio
Company A	1.667	15.60	1.20	17.50	1.13
Company B	2.540	10.20	0.80	8.80	0.74
Company C	5.420	5.70	2.50	7.70	1.20
Company D	0.587	25.20	1.20	30.20	1.50
Company E	4.570	10.40	2.40	7.40	2.10
Company F	1.245	9.70	1.25	15.70	0.90
Company G	15.247	3.10	1.40	3.30	0.90

Note: The number of shares of the company remained constant during this quarter.

**DIRECTIONS** for questions 25 and 26: Select the correct alternative from the given choices.

25. The percentage decrease in the Debt Value at the end of the quarter as compared to the beginning of the quarter was the maximum for which of the following companies?

- (A) Company C  
(B) Company E  
(C) Company B  
(D) Company G

26. What was the approximate difference (in ₹ mn) between the Enterprise Value of Company D at the beginning of the quarter and that at the end of the quarter?

- (A) 11.8 (B) 12.3 (C) 10.8 (D) 11.3

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

27. Among the seven companies, what is the second highest value of the ratio of the Debt Value to the Enterprise Value at the end of the quarter?

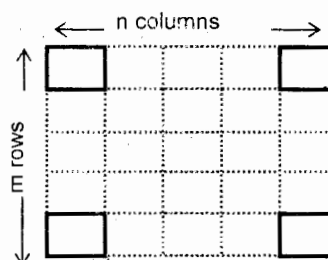
**DIRECTIONS** for question 28: Select the correct alternative from the given choices.

28. Which of the following companies has the highest Enterprise Value at the end of the quarter?

- (A) Company C  
(B) Company G  
(C) Company A  
(D) Company E

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

There is a grid of cells of  $m$  rows and  $n$  columns, as shown below, in which each cell is coloured either Red, Blue or Green.



Now, 12 colour-changing operations, belonging to four different classes – A, B, C and D – are defined using two-character codes as follows:

- A5, A2, A1  
B3, B2, B1  
C4, C3, C1  
D5, D3, D1

The first character of each operation defines its class and the second character represents the number of cells on which it is applied. Each class of operations changes the colour of the specified number of cells, i.e., the second character in the operation, from one colour to another as follows:

- A – From Red to Green  
B – From Green to Red  
C – From Blue to Red  
D – From Red to Blue

Any operation is performed only if the relevant numbers of cells are available to be acted upon.

**DIRECTIONS** for question 29: Select the correct alternative from the given choices.

29. Three operations B3, C4 and A5 are carried out on a grid containing 25 cells, in five rows and five columns. After these operations it was noticed that the grid can be restored to its original configuration by performing exactly three operations. Which of the following could be those three operations?
- (A) A2, C3, D5  
(B) B2, D3, D1  
(C) B2, B3, D5  
(D) A2, C1, D3

**DIRECTIONS** for question 30: Type your answer in the text box provided below the question.

30. In a grid of 24 cells, in six rows and four columns, five operations are carried out, one after the other. If there are no Blue cells in the initial grid, and there are no Green cells in the final grid, what is the minimum possible difference between the number of Red cells and the number of Blue cells in the final grid?

**DIRECTIONS** for question 31: Select the correct alternative from the given choices.

31. In a grid of 12 cells, in 4 rows and 3 columns, there are an equal number of cells of each of the three colours. Now, if five additional operations, A3, A7, C5, D2 and D4, are also defined in a similar manner, then which of the following is not a possible sequence of operations that can be performed on the grid (in the same order as they are listed, from left to right)?
- (A) A3, B2, C4  
(B) D2, C5, A7  
(C) A2, D2, C4  
(D) B2, D4, A3

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

32. If each class of operations (A, B, C, D) can be applied on any number of cells, and there is a grid of 15 cells, with at least one cell of each of three colours, arranged in 5 rows and 3 columns and the operations are carried out in the sequence A, B, C, D, A, B, ... and so on, such that each operation is applied on at least one cell, what is the minimum number of operations after which the grid has 15 cells of a single colour?

### SECTION – III

Number of Questions = 34

**DIRECTIONS** for questions 1 to 4: Type in your answer in the input box provided below the question.

1. If the roots of the equation  $x^3 - 21x^2 + ax - 168 = 0$  are in arithmetic progression, find the value of  $a$ .

2. In a triangle ABC, medians AD and BE are perpendicular to each other. If the length of the median AD is 8 cm and the area of the triangle is 144 sq. cm, find the length (in cm) of the median BE.

3. What is the largest number which leaves remainders of 4, 6 and 2 when it divides 460, 690 and 990 respectively?

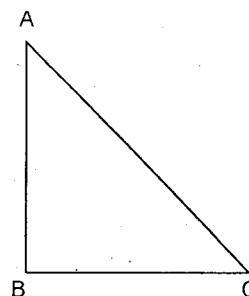
4. If  $a = \log_3 12$  and  $b = \log_8 72$ , and  $(a - 1)(b - 1) = K$ , find the value of  $15K$ .

**DIRECTIONS** for questions 5 to 7: Select the correct alternative from the given choices.

5. If  $f(x) = \frac{1}{1+x}$ , then  $f(3x)$ , when expressed in terms of  $f(x)$ , will be

- (A)  $3f(x)$   
(B)  $\frac{f(x)}{3+2f(x)}$   
(C)  $\frac{f(x)}{3-2f(x)}$   
(D)  $\frac{f(x)}{2-3f(x)}$

6. In the right angled triangle given below,  $AB = BC = 6\sqrt{2}$  cm. The side AB is divided into 13 equal parts by drawing 12 line segments, each parallel to BC, from AB to AC. Find the sum of the lengths of these 12 line segments.



- (A)  $36\sqrt{2}$  cm  
(B)  $39\sqrt{2}$  cm  
(C)  $42\sqrt{2}$  cm  
(D)  $72\sqrt{2}$  cm

7. There are two series of numbers in geometric progression, each having the same number of terms, such that the fourth term and the sixth term of the first series are equal to the second term and the third term of the second series respectively. If the last term of the second series is 64 times the last term of the first series and the fifth term of the first series is eight times the second term of the first series, then find the number of terms present in each of the series.
- (A) 8  
(B) 6  
(C) 10  
(D) 9



**DIRECTIONS** for questions 8 to 11: Type in your answer in the input box provided below the question.

8. A number has six factors, of which three are even. If the sum of all the odd factors of the number is 57 less than the sum of all its even factors, then what is the sum of all its factors?

9. If the roots of the quadratic equation  $x^2 - 24x + N = 0$  are prime numbers, how many distinct values can  $N$  assume?

10. The average age of a group of persons is 16 years. A person of age 36 years leaves the group and another person joins the group, thereby reducing the average age by two years. Find the age (in years) of the newly joined person, if there are eight persons in the group.

11. Find the maximum number of distinct regions into which the area inside a circle can be divided by drawing six chords.

**DIRECTIONS** for questions 12 to 14: Select the correct alternative from the given choices.

12. In rectangle ABCD, a semicircle is constructed with AB as the diameter. The semicircle intersects CD at points P and Q. M is a point on AB such that PM is perpendicular to AB. If the perimeters of rectangles AMPD and MBCP are 18 cm and 36 cm respectively, find the area (in sq.cm) of the semicircle.

(A)  $28.125\pi$  (B)  $32.625\pi$   
(C)  $36.375\pi$  (D)  $38.125\pi$

13. Two cars P and Q start from two points A and B towards each other simultaneously. They meet for the first time 40 km from B. After meeting they exchange their speeds as well as directions and proceed to their respective starting points. On reaching their starting points, they turn back with the same speeds and meet at a point 20 km from A. Find the distance between A and B.

(A) 130 km (B) 100 km  
(C) 120 km (D) 110 km

14. If  $a$  and  $b$  are positive real numbers, then which of the following is necessarily TRUE?

(A)  $|a + b| < |a| + |b|$   
(B)  $|a + b| = |a| + |b|$   
(C)  $|a - b| \geq |a| + |b|$   
(D)  $|a - b| = |a| - |b|$

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

15. Sethi and Wilson play a snooker match consisting of nine games. The winner is decided by the method of 'Race to 5', i.e., the first person to win five games is

declared the winner and the match ends the moment the winner is declared. In how many ways can the match conclude?

**DIRECTIONS** for question 16: Select the correct alternative from the given choices.

16. If the cost of three pencils and six erasers is ₹24 and the cost of a pencil is 20% more than that of an eraser, what is the cost of one pencil?  
(A) ₹2.5 (B) ₹3 (C) ₹3.5 (D) ₹4

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

17. Find the total number of prime factors of the number  $40C_{30}$ .

**DIRECTIONS** for questions 18 to 22: Select the correct alternative from the given choices.

18. An unbiased coin is tossed nine times and a total of five heads and four tails turned up. If the coin is now tossed for the tenth time, what is the probability that a tails will turn up?

(A)  $\frac{1}{5}$  (B)  $\frac{1}{2}$  (C)  $\frac{4}{5}$  (D) 1

19. If  $y = \min \{|6x - 4|, |12 - 9x|\}$ , find the range of  $x$  for which the value of  $y$  increases with  $x$ .

(A)  $\left(x \leq \frac{2}{3}\right) \cup \left(x > \frac{4}{3}\right)$

(B)  $\frac{2}{3} \leq x \leq \frac{16}{15}$

(C)  $x \geq \frac{4}{3}$

(D)  $\left(\frac{2}{3} \leq x \leq \frac{16}{15}\right) \cup \left(x \geq \frac{4}{3}\right)$

20. If in a certain race, the distance by which A beats B is the same as that by which B beats C, then which of the following is true regarding the speeds of A, B and C.

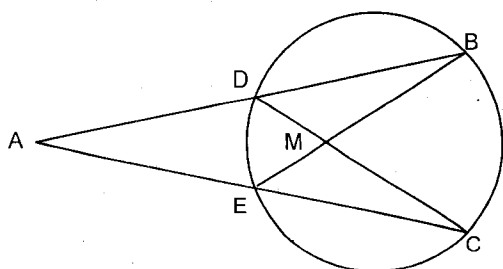
(A) Speed of B is the Arithmetic Mean of the speeds of A and C.  
(B) Speed of B is the Harmonic Mean of the speeds of A and C.  
(C) Speed of B is the Geometric Mean of the speeds of A and C.  
(D) None of the above.

21. The sum  $\frac{3}{2} + \frac{5}{4} + \frac{9}{8} + \frac{17}{16} + \dots$  to 99 terms is

(A)  $100 - \frac{1}{2^{99}}$  (B)  $101 - \frac{1}{2^{99}}$

(C)  $100 + \frac{1}{2^{99}}$  (D)  $99 + \frac{1}{2^{100}}$

22. In the figure below, if  $DM = 4$  cm,  $MC = 18$  cm and  $\frac{AE}{AD} = \frac{9}{11}$ , then find the measure (in cm) of MB.



- (A) 6 (B) 8 (C) 10 (D) 12

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

23. A boy is running on a circular track around a playground. There is a tower situated outside the playground. The boy observes that while making one complete round along the track, the angle of elevation of the top of the tower is  $45^\circ$  at two points on the track and  $60^\circ$  at two other points on the track. If these four points, when joined, form a square, the area of which is  $800(12 - 6\sqrt{2})$  sq. m., find the height (in m) of the tower.

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

24. Find the area of the circle inscribed inside the triangle formed by the  $x$ -axis, the  $y$ -axis and the line  $15x + 8y - 120 = 0$ .
- (A)  $4\pi$  sq. units (B)  $9\pi$  sq. units  
(C)  $6.25\pi$  sq. units (D)  $16\pi$  sq. units

**DIRECTIONS** for questions 25 and 26: Type in your answer in the input box provided below the question.

25. A and B, working together, can do a certain work in 20 days, whereas B and C, working together, can do it in 30 days. A, B and C together started the work but A left after 8 days, while B left after another 10 days and the remaining work was completed by C alone in another 8 days. Had A and B not left, then in how many days would A, B and C together have completed the work?

26. If  $x^{\frac{1}{5}} > x^{\frac{1}{3}}$ , then how many of the following statements are definitely true about  $x$ ?

- I.  $x^2 > x^3$  II.  $x^{\frac{1}{3}} > x^4$   
III.  $x^{\frac{1}{3}} > x^{-3}$  IV.  $x^{\frac{-1}{3}} > x^3$

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

27. Each of three friends, A, B and C, has a certain number of marbles with him, such that the number

of marbles with B is 12% more than that with C and 12% less than that with A and C together. If the number of marbles with B is less than 500, then find the total number of marbles with all the three friends.

- (A) 658  
(B) 940  
(C) 846  
(D) Cannot be determined

28. If  $x$ ,  $y$  and  $z$  are odd integers, which of the following statements is not true?

- (A)  $(x^2y + y^2z + z^2x)xyz$  is odd  
(B)  $(xy + yz + zx)(x + 2y + 3z)$  is even  
(C)  $(xy + yz + zx)(2x + y)^2$  is odd  
(D)  $(2x + 3y + 4z)(xyz + 6)$  is even

29. If the cost price, the selling price and the marked price of an article are in arithmetic progression and it is known that a profit was registered by selling the article, then which of the following statements is true?

- (A) The profit percentage was less than the discount percentage.  
(B) The profit percentage was equal to the discount percentage.  
(C) The mark up percentage was double the profit percentage.  
(D) The profit percentage when calculated on the selling price was more than the actual profit percentage (i.e., when calculated on the cost price).

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

30. A man deposited ₹9600 in each of two different schemes, both paying  $r\%$  interest per annum, one under simple interest and the other under compound interest, compounded annually. If the difference between the two amounts receivable at the end of two years from the start of the two schemes was ₹150, then find  $r$ .

31. If  $x$  and  $y$  are distinct prime numbers less than 30, how many ordered pairs  $(x, y)$  satisfy the inequality  $4x + y > 100$ ?

**DIRECTIONS** for question 32 to 34: Select the correct alternative from the given choices.

32. Sumanta said to Tamal, "When I was half as old as you are today, you were one-sixth as old as I am now". If Sumanta is eight years older than Tamal, what is the sum of their present ages? (in years)
- (A) 48 (B) 64 (C) 60 (D) 56

33. Find the distance between the lines  $5x + 12y + 21 = 0$  and  $15x + 36y + 297 = 0$ .
- (A) 3 (B) 6 (C) 13 (D) 39

34. If  $x \in \mathbb{R} - \{-1, -3\}$ , and  $y = \frac{x+2}{(x+1)(x+3)}$ , find the range of  $y$ .
- (A)  $[0, 3]$  (B)  $[-2, 5]$   
(C)  $\left[\frac{1}{3}, \infty\right)$  (D)  $(-\infty, \infty)$