AIMCAT 2019

VA/RC

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.

[Students] in my Linguistics Course often ask whether all human beings think in a similar way regardless of the language they use or if the language(s) they speak affect(s) the way they think. While some linguists and psychologists believe that there can be no expression of thought without language, I argue in favour of a universal groundwork for perception and thought in all human beings, and consider language a filter, enhancer, or framer of perception and thought...

Languages differ from one another. English, Indonesian, Russian, and Turkish speakers end up attending to, partitioning, and remembering their experiences differently because they speak different languages. Languages focus one"s perception on specific aspects of the world.

.... In Pormpuraaw, [N. Australia], Aboriginals speaking the Kuuk Thaayorre language don't use relative spatial terms ("right," "left," "forward," "back") – which English speakers use – but they use

absolute cardinal-direction terms (north, south, east, west) instead. They (are accustomed to) say "There's an ant on your southeast leg" or "Move the cup to the north northwest a bit." Their language (with absolute spatial deictics) makes them better than English speakers at staying oriented, keeping track of where they are (even in unfamiliar landscapes) and performing navigational feats.

People who think differently about space also think differently about time thanks to language. While English speakers arrange time from left to right, speakers of Kuuk Thaayorre arrange time from east to west, being fully aware of the direction they face...

English speakers talk about time using horizontal spatial metaphors ("The best is ahead of us"), whereas Mandarin speakers have a vertical metaphor (The next month is the "down month"). English speakers perceive time in terms of length ('short', 'long'). Spanish and Greek speakers perceive time in terms of amount ('big', 'little')...

In our lab, we've taught English speakers different ways of talking about time. In one study, English speakers were taught to use size metaphors (as in Greek) to describe duration (e.g., a movie is larger than a sneeze), or vertical metaphors (as in Mandarin) to describe event order. Once the English speakers had learned to talk about time in these new ways, their cognitive performance began to resemble that of Greek or Mandarin speakers. So, patterns in a language can indeed play a causal role in constructing how we think.

Whenever we construct or interpret a linguistic statement, we need to focus on specific aspects of the situation that the statement describes. Interestingly, some brain imaging facilities are now allowing us to examine these effects. Recent research indicates that language affects the categorical perception of colour (Russian speakers, who make an extra distinction between light and dark blues in their language, are better able to visually discriminate shades of blue). This effect is stronger in the right visual field than in the left. Discrimination of colours encoded by different words also provokes stronger and faster responses in the left hemisphere language regions than discrimination of colours encoded by the same word. Research shows that the left posterior temporoparietal language region may serve as a top-down control source that modulates the activation of the visual cortex. These current biolinguistic research examples help to better understand some classic topics in linguistics [example: Relation between language and thought?]

...[L]anguage helps people construe events, keep track of number, understand material substance; perceive emotion, musical pitch, kinship relations etc. The languages we speak shape the way we

think, see the world and live our lives. Studying language has given scientists a peak into the very nature of human nature. Studies have shown that bilinguals change how they see the world depending on which language they are speaking. The Arabic-Hebrew bilinguals showed more positive implicit attitudes towards Jews when tested in Hebrew than when tested in Arabic. ...The next steps are to understand how the knowledge we possess is assembled through languages and this will help us to create ideas that go beyond the currently thinkable.

Q1. Which of the following is the most suitable title for the passage?

a) The World of Words

b) Does language shape our thoughts and experiences?

c) **Language as a vehicle of thought**

d) The philosophy of language

Q2. Which of the following findings will not cast a serious doubt on the conclusion "There can be no expression of thought without language." reached by some linguists and psychologists (para 1)?

a) Pre-linguistic infants as well as non-human primates devoid of the language function can solve complex problems involving spatial memory.
 b) 45% of all real thinking in humans involves the use of systems of representation such as maps and models that are encoded in non-linguistic form.

c) Among human adults, artistic or musical thought does not demand linguistic expression: it is purely visual or auditory.

d) The specialized languages of maths and science enable humans to construct theories in their minds and make predictions about matters they would otherwise be unable to grasp.

Q3.   Which of the following studies will further the next course of action suggested by the author, to the greatest possible extent, as can be inferred from the passage?

a) A study in Discourse Analysis proving that bilingual people start thinking differently when they switch from one language to another.

b) A cognitive linguistic study demonstrating that speakers of different languages think differently.

c) **A psycholinguistic study delineating the mechanisms through which languages help to construct the complex knowledge systems that humans possess.**

d) A sociolinguistic study revealing subtle differences in human natures based on the languages people speak.

Q4.   Which of the following does not concur with the information presented in the passage?

a) Linguistic processes are pervasive in several fundamental domains of thought.

b) **Speakers of different languages can differ in how well they can remember who did what.**

c) **Teaching people new colour words can positively influence their ability to discriminate colours.**

d) Speakers of some languages with absolute spatial frames show a difference in navigational ability from those of languages having relative reference frames.

Q5.   The main objective of the passage is to

a) **indicate that there are cross-linguistic differences in cognition and that the languages we speak affect our perceptions of the world.**

b) **highlight that when you learn a new language, you inadvertently learn a new way of thinking, but the reverse does not hold true.**

c) **demonstrate that, without language, we might be incapable of interpreting and organizing the reality of the external world.**

d) establish that current biolinguistic research can help achieve a more balanced understanding of the relationship between language and thought.

Perhaps no philosopher more forcefully argued for the necessity of the collective than Hobbes, the first English translator of Thucydides. Hobbes sought to understand the way in which free individuals driven by self-interest could form stable collectives. Confronting the devastation of the civil wars in England in Leviathan (1651), he follows Thucydides in diagnosing disease in the body politic by analogy to human sickness, comparing epilepsy to civil war... But Hobbes inverts the paradigm of the ancient body politic analogy. Whereas Plato in the Republic compares the state to the individual, Hobbes analogises the individual to the state.

For Hobbes, free individuals live in a natural state of conflict and war. Without a social contract, humanity is limited to a zero-sum struggle for finite resources, what Hobbes describes as a 'war of everyone against everyone'. We choose the 'covenant' of the state to ensure our 'preservation' and a 'contented life'. And, while all forms of government involve the loss of individual liberty, only monarchy secures the greatest stability and peace because it is least subject to alteration.

Like Hobbes, Locke bases much of his political reasoning on an extended analogy between states and bodies. Yet while Hobbes defended absolute monarchy, Locke wrote his Second Treatise of Civil Government … to justify the Glorious Revolution of 1688, which strengthened Parliament and resulted in the abdication of James II. For Locke, a body politic forms when every individual consents to be bound by the same impartial laws. The king cannot, by analogising himself to the brain, claim exemption from the laws that govern any other 'part' of the body. Though Locke is still writing within the body politic metaphor, he is pushing at its limits: the hierarchy implied by the biological structure of the body is dissolving into a more horizontal model defined by consent of the governed, and the universal application of law. Hobbes argued that a strong monarch provides salvation from a state of nature; for Locke, however, rule by a monarch is worse than a state of nature.

Hobbes and Locke discern different dangers, but both share a largely defensive concept of government. Locke grants political bodies only a limited goal: 'The great and chief end, therefore, of men uniting into commonwealths, and putting themselves under government, is the preservation of their property.' Absent from this vision is Aristotle's idea that the basic purpose of political life is human flourishing, not merely the provision of security and the protection of private property. It's as if

Hobbes and Locke were content to define the health of the body politic only by the absence of disease.

Yet seeing others and ourselves as parts of a larger metaphorical body reminds us of the crucial fact of our interdependence, helping to rescue us from what Hannah Arendt described as 'the weightless irrelevance' of our individual affairs. Meditation on the meaning of the body politic reminds us that the individual is fundamentally a component of a collective political organism. To avoid becoming an agglomeration of fractured and easily manipulated individuals…we must return to the difficult task of negotiating a public defence of the body politic. If we fail to voice a collective vision of the body politic today, we are destined to pay an extreme price for our individualism: the loss of a world in which it is worth being free.

Q6.   Hobbes' reverses the ancient body politic analogy by saying that:

a) **a state suffering from civil war is like an individual suffering from epilepsy.**

b) **a state is a collective of conflicted individuals.**

c) **an individual is a microcosmic representation of the state.**

d) free individuals are at war against each other for resources.

Q7.   The author mentions Aristotle's idea of a political life to highlight:

a) **that the absence of disease doesn't really indicate a healthy body politic.**

b) **the disagreement between Hobbes and Locke on the best form of government.**

c) **Hobbes and Locke's limited vision with respect to the basic purpose of political life.**

d) **the great and chief end of individuals forming a government.**

Q8.   Hobbes' suggestion for a social contract could lead to which of the following scenarios?

 a) **Individuals scrap for survival in a war-torn country leading to a dystopia.**

 b) **Individuals produce goods collectively and the monarch takes control of it.**

 c) **Individuals choose a ruler after regular intervals based on eligibility.**

d) **Individuals exchange absolute freedom for protection by a king.**

Q9.   Which of the following is not an accurate representation of the ideas mentioned in the passage?

 a) **Locke rejects the body politic metaphor for the inherent partiality in analogising the king to the brain.**

 b) **Hobbes believed that stability and change do not go hand in hand.**

 c) **Aristotle believed that politics helps societies evolve beyond providing security.**

 d) **Thucydides analogizes civil war in a country with an epilepsy in an individual.**

Number of words and Explanatory notes for RC:

Number of words: 557

Option A: Consider the sentences: '*For Locke, a body politic forms when every individual consents to be bound by the same impartial laws.* **The king cannot, by analogising himself to the brain, claim exemption** *from the laws that govern any other 'part' of the body.* **Though Locke is still writing within the body politic metaphor,** *he is pushing at its limits.'* The choice is an inaccurate representation of the data. Locke doesn't reject the body politic metaphor. Locke simply says that the king cannot use the metaphor and claim exception. Hence, Option A is the answer.

Option B: This can be understood from: '*And, while all forms of government involve the loss of individual liberty,* **only monarchy secures the greatest stability and peace because it is least subject to alteration**'. Monarchy, according to Hobbes, represents minimal change. Hence, Option B is not the answer, since it is true according to the passage.

Option C: Consider the sentences: '*Absent from this vision is* **Aristotle's idea that the basic purpose of political life is human flourishing, not merely** *the provision of security and the protection of private property.'* From this, it can be understood that Aristotle looked at a greater role for politics, beyond protection and security. Hence, Option C is not the answer.

Option D: Consider the lines: '*he follows Thucydides in diagnosing disease in the body politic by analogy to human sickness,* **comparing epilepsy to civil war**. From this, it can be understood that Thucydides did compare epilepsy and civil war in his body politic metaphor (and translated by Hobbes). Hence, Option D is not the answer.

Choice (A)

Q10.   Which of the following statements best captures the essence of the author's main suggestion in the passage?

a) **Preservation of individual freedom should be the central focus of any government.**

b) **Individual freedom loses its purpose without a constant debate on the idea of a collective organism.**

c) **The governed have the right to choose who rules them.**

d) **Individuals should have the liberty to voice a collective impartial vision that binds everyone.**

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.

Escaping predators, digestion and other animal activities – including those of humans – require oxygen. But that essential ingredient is no longer so easy for marine life to obtain, several new studies reveal. In the past decade, ocean oxygen levels have taken a dive – an alarming trend that is linked to climate change, says Andreas Oschlies, an oceanographer at the Helmholtz Center for Ocean Research Kiel in Germany, whose team tracks ocean oxygen levels worldwide...

[T]he scale of the dip calls for urgent attention, Oschlies says. Oxygen levels in some tropical regions have dropped by a startling 40 percent in the last 50 years, some recent studies reveal. Levels have dropped more subtly elsewhere, with an average loss of 2 percent globally.

Ocean animals, … however, respond to even slight changes in oxygen by seeking refuge in higher oxygen zones or by adjusting behaviour, Oschlies and others in his field have found. These adjustments can expose animals to new predators or force them into food-scarce regions. Climate change already poses serious problems for marine life, such as ocean acidification, but deoxygenation is the most pressing issue facing sea animals today…

A warming ocean loses oxygen for two reasons: First, the warmer a liquid becomes, the less gas it can hold. That is why carbonated beverages go flat faster when left in the sun, Oschlies says. Second, as polar sea ice melts, it forms a layer of buoyant water at the sea surface above colder, more saline waters. This process creates a sort of lid that can keep currents from mixing surface water down to deeper depths. And because all oxygen enters this habitat at the surface – either directly from the atmosphere or from surface-dwelling phytoplankton producing it during photosynthesis – less mixing means less of it at depth.

Some coastal regions around the equator naturally are low-oxygen hotspots because they contain nutrient-rich waters where bacterial blooms consume oxygen as they break down dead marine life. But shifts in ecosystems elsewhere – including in the open ocean and around the poles – especially surprises and concerns Oschlies and others because these regions were not considered as vulnerable. Climate models projecting future change have also routinely underestimated the oxygen losses already observed around the world's oceans – another reason why this trend calls for more attention, he says.

[Even] very subtle dips in oxygen [affect] where zooplankton – animals at the base of the food web – congregate in the water column … Some species swim to deeper, cooler waters with more oxygen. [But] it can be harder to find food or reproduce in lower-temperature waters. Many predators – including fishes, squids and whales – either eat zooplankton or eat fishes that eat zooplankton, so the ways zooplankton cope will have ramifications up the food web…

Even small drops in oxygen impair vision in some zooplankton. Many species of zooplankton rely on visual cues to migrate down the water column each morning to avoid predators, so sight loss could impede their ability to pick up on these light cues…

Coastline fisheries can also face the added pressure of agricultural runoff fertilizing algal blooms that consume copious oxygen as they decay – as has long been the case in the Gulf of Mexico near the

mouth of the Mississippi River. These "dead zones" force some fishes to seek higher oxygen areas on the edges of their typical ranges...

Q11. Which of the following is not a consequence of the deoxygenation of the oceans?

 a) **Some species trying to respond to lower oxygen levels might become vulnerable to new predators.**

 b) **Some species might migrate to waters with more oxygen but they face scarcity of food.**

 c) **Food sources of predators, such as fishes and squids, might be affected.**

 d) **Algal blooms might consume enormous amounts of oxygen near coastlines.**

Q12. A warmer ocean poses danger for sea animals because:

a) **the melting of polar sea ice increases the buoyancy of the saline water layer.**

b) **the capacity of the ocean to hold oxygen is inversely proportional to its temperature.**

c) **warmer oceans become low oxygen-hotspots because of bacterial blooms.**

d) **oxygen-producing phytoplanktons only thrive in cooler waters.**

Number of words and Explanatory notes for RC:

Number of words: 554

Option A: Consider the sentences: *Second, as polar sea ice melts, it forms a layer of buoyant water at the sea surface above colder, more saline waters.* This process creates a sort of lid that can keep currents from mixing surface water down to deeper depths. And because all oxygen enters this habitat at the surface – either directly from the atmosphere or from surface-dwelling phytoplankton producing it during photosynthesis – less mixing means less of it at depth. The warmer ocean prevents mixing of oxygen between surface water (oxygen rich) and waters at a depth. Also, the buoyancy of the saline water layer is not increased. A buoyant layer is formed above the saline waters. Hence, Option A is not the answer.

Option B: Consider the sentences: '*A warming ocean loses oxygen for two reasons: First, the warmer a liquid becomes, the less gas it can hold.*' This shows why a warming ocean poses a danger to sea animals. Hence, Option B is the answer.

Option C: Consider the sentences: '*Some coastal regions around the equator naturally are low-oxygen hotspots because they contain nutrient-rich waters where bacterial blooms consume oxygen as they break down dead marine life.*' This shows that some regions losing oxygen because of bacterial activity is normal without considering warming of the ocean. Hence, Option C is easy to eliminate.

Option D: Phytoplanktons are present at the surface of water. Zooplanktons swim to cooler waters for more oxygen. Hence, this option doesn't accurately explain the problem with warmer waters. Option D is not the answer.   Choice (B)

Q13. Even subtle dips in oxygen affecting zooplanktons is critical because of all the following EXCEPT:

a) **Zooplanktons cannot congregate when the water columns are warmer.**

b) **Zooplanktons are at the bottom of the food chain and hence, other species up the chain are affected.**

c) **A drop in oxygen impairs the vision of zooplanktons and therefore, their movement.**

d) **Lower temperature waters affect the reproductive ability of some species of zooplanktons.**

Q14.   Which of the following doesn't lead to the deoxygenation of the oceans?

a) **Bacteria use up oxygen to break down dead marine life in nutrient-rich waters.**

b) **Increasing temperatures reduce the oxygen-holding capacity of water.**

c) **There is a depletion of zooplanktons because of migration to cooler waters.**

d) **Agricultural wastes in dead zones consume more oxygen.**

Q15.   Which of the following adds more depth to Andreas Oschlies' study mentioned in the passage?

 a) **A study of how ocean currents help in mixing water across layers at different temperatures.**

 b) **A study of the relation between ocean warming and ocean deoxygenation.**

 c) **A study of the number of fish species that have gone extinct corresponding to a dip in oceanic oxygen levels.**

 d) **A study of the amount of oxygen released by surface-dwelling phytoplanktons.**

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.

The college admissions bribery scandal has captivated the country – Hollywood stars from Desperate Housewives and Full House are involved! – and it leaves ample room for outrage. Spots at elite selective institutions that could have gone to hardworking students and athletes who deserved them instead went to kids whose parents paid for fraudulent tests or bogus athletic profiles. Payments for cheating went to a sham charity, making the fraud tax-deductible for the alleged perpetrators.

But let's not ignore the scandal's connection to another noxious stink polluting college sports. By selling out enormous stadiums, selling apparel and through corporate sponsorships and media rights deals – among other revenue sources – big-time football and basketball teams bring in millions for their schools. Often, these revenues support a school's entire sports enterprise. Despite that cash spigot, NCAA rules mean these football and basketball players can't earn compensation beyond the value of a scholarship and a cost of attendance stipend. Meanwhile, 55% of men's basketball

players at the so-called "Power 5" major conference schools (the Big 10, Big 12, ACC, SEC, and Pac-12) are black, according to NCAA data, while nearly half of the Power 5 football players are black. The performances of these unpaid players, many of whom come from low-income families, are often subsidizing sports like tennis, where 48% of the men's players in the power conferences are white and just 12% are black, and other sports that are even more exclusively white, like men's water polo (82%), women's rowing (75%). Just 2% of men's water polo players and women's rowers at big conference schools are black.

The dynamic of unpaid, often low-income black athletes in high-revenue sports generating revenues that finance opportunities for, generally speaking, white athletes with wealthier backgrounds in low-revenue sports like water polo is troubling enough. Add this scandal, in which wealthy and often white families were allegedly scamming athletic opportunities that may not exist without the labour of unpaid black athletes, and the case to rethink the system grows even stronger…

"There's no side door, give me a break," says Harry Edwards, the famed sports sociologist and activist who helped organize the black power salute at the 1968 Olympics. "You provided a sewer line to the basement stairs. You have a situation where these coaches, on the backs of unpaid black labour, are bringing in rich white kids who have less legitimacy on campus than the black kids who are so often complained about because they're quote 'not interested in academics.' That's a travesty."

Luckily, the sewer can be fixed. Administrators can start by making sure recruited athletes actually play the sport they're purporting to be good at. "There's no way any athletic compliance staff should have missed all of this," says sports attorney Donald Jackson, an adjunct professor at Samford University's Cumberland School of Law, who has represented athletes in NCAA eligibility cases.

The next step: investing athletic funds responsibly. "This is an opportunity for colleges and universities to look themselves in the mirror," says Angela Reddock-Wright, an employment lawyer in Southern California who represents higher education clients. "Make sure the athletes making lots of money for the schools are taken care of" – rather than paying for phony water polo. Money that could be going to unpaid black players seems to have financed corrupt opportunities for rich white families. So now, more than ever, isn't it time to just pay the players?

Q16.   The expression 'the sewer can be fixed' is:

a) **a metaphor for the back-door entry into universities provided to children from elite families.**

b) **an analogy for stopping rich white families from scamming athletic opportunities on the back of black unpaid labour.**

c) **a snide remark alleging the athletic compliance staff of negligence of duty.**

d) **a suggestion to make drastic changes to prevent exploitation of college seats by those who excel at sports.**

Number of words: 562

Consider the sentences: 'Luckily, the sewer can be fixed. **Administrators can start by making sure recruited athletes actually play the sport** they're purporting to be good at. "There's no way any athletic compliance staff should have missed all of this,"' and 'You provided a sewer line to the basement stairs. You have a situation where **these coaches**, on the backs of unpaid black labour, **are bringing in rich white kids** who have less legitimacy...'

From these sentences it can be understood that the sewer is the back-door entry into colleges given to undeserving rich white students.

Option A: The sewer is a metaphor for the back-door entry. That the sewer can be fixed is an analogy, a comparison of events ('parallel reasoning'), for how the administration can tackle this problem. Hence, Option A is not the answer as it is incomplete. Option A only refers to 'The sewer' and not, to the expression 'The sewer can be fixed.'

Option B: That the sewer can be fixed is an analogy for the belief that the system can be repaired. By this the author means that the rich white students who scam their way into college should be prevented from exploiting the system. This can be done by making sure those who get into the college on the basis of their sporting credentials, actually prove their sporting abilities. Generally, such students are freeriding on the back of other students with sporting abilities. Therefore, Option B is the answer.

Option C: The compliance staff were blamed by the author for the corruption. However, the expression itself, about the sewer being fixed, is not just about passing a snide, sarcastic, negative remark. It is more about how the situation can still be repaired. Hence, Option C is not the answer.

Option D: The author speaks in favour of students whose sporting abilities give them a deserving seat in the college (but which are exploited by those who scam their way into college without any real sporting abilities). The author doesn't really argue in favour of giving away seats reserved for those with sporting capabilities to those who study well. Hence, Option D is not the answer.   Choice (B)

Q17.   According to the passage, which of the following would qualify as 'investing athletic funds responsibly'?

a) **Encourage black students to take up other sports like water-polo and tennis where their participation is lower.**

b) **Prevent rich white students from taking advantage of scholarships that should have benefited black students from low-income families.**

c) **Ensure that black students get their share of the spoils in high-revenue sports.**

d) Avoid channelling the revenues generated by popular sports into supporting less popular sports.

Q18.   Which of the following findings, if true, would most undermine the author's primary argument in the passage?

a) **A justifiable share of revenues that must be paid to students playing sports for school teams is difficult to work out.**

b) **The revenues earned by a university in a popular sport are barely enough to support the entire pool of students who contribute to the team of that sport.**

c) **The exposure provided by Power 5 major conference schools helps black students build successful sporting careers.**

d) **Elite institutions do not invest money in sports that do not generate revenues higher than the investments made on them.**

Q19.   Which of the following best explains the 'travesty' mentioned in the last line of the antepenultimate para of the passage ('That's a travesty')?

 a) **Black students, whose legitimacy is questioned based on their academic interest, are exploited to fund undeserving rich white students on campus.**

b) **Black students are used as unpaid labour to subsidize the sports that rich white students play.**

c) **Black students are more interested in sports and less interested in academics.**

d) **Black students earn fewer accolades in sports than the rich white kids who get back-door entry into the elite institutions.**

Q20.   All of the following have been denounced by the author in the passage EXCEPT:

 a) **Spots at elite selective institutions were given away on the basis of phony test scores and bogus sports profiles.**

 b) **Revenues earned by the sports dominated by black players subsidize the sports dominated by white players.**

 c) **Players won't get compensated beyond the scholarship and a cost of attendance stipend for their sporting exploits.**

 d) **There is a massive disparity in the percentage of black and white students in various sporting teams.**

Option A: The author has clearly denounced/criticised the system for allowing fraudulent selections. This has been mentioned in the following lines: '*Spots at elite selective institutions that could have gone to hardworking students and athletes who deserved them instead **went to kids whose parents paid for fraudulent tests or bogus athletic profiles**.*' Hence, Option A is not the answer.

Option B: This is clearly demonstrated in the sentences: '**The performances of these unpaid players**, *many of whom come from low-income families,* **are often subsidizing sports** *like tennis, where 48% of the men's players in the power conferences are white and just 12% are black, and other sports **that are even more exclusively white**...*' This has been criticised by the author, given the author predominantly exhorts paying the players who play for the high revenue sports. Hence, Option B is not the answer.

Option C: The author clearly criticises this here: '*Often, these revenues support a school's entire sports enterprise. Despite that cash spigot, NCAA rules mean these football and basketball **players can't earn compensation beyond the value of a scholarship and a cost of attendance stipend***'. This is further strengthened by mentioning that players should be paid: '*Money that could be going to unpaid black players seems to have financed corrupt opportunities for rich white families. So now, more than ever, isn't it time to just pay the players?*' Option C is not the answer.

Option D: While the author does talk about the disparity of black and white players across various sports (e.g. basketball is dominated by black players while tennis and water polo are dominated by white players), the author isn't criticising this disparity. The author mentions these numbers merely to indicate that black players make money for colleges which is used to subsidize sports dominated by white players. The solution the author provides is that players should get part of the revenues (and the author doesn't in any way indicate that more black players should be encouraged to take up other sports). Hence, Option D is the answer.   Choice (D)

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.

In 2006, the International Astronomical Union (IAU) redefined "planet" and stripped Pluto of its planethood. The basis of that decision: A number of other worlds have been discovered at the margins of the observable solar system, and Pluto might not even be the largest of these frosted runts. Astronomers suspect there are hundreds more of these worlds waiting to be discovered.

How, then, could Pluto alone be called a planet? The IAU needed to figure out how to classify Pluto and its friends, and describe what made them different from the classical eight planets. So, the assembly voted to call them "dwarf planets," and Pluto became one of the first entries in the new

official category. Joining it are Ceres, in the asteroid belt, and Eris, Haumea, and Makemake, which like Pluto live in the icy Kuiper Belt beyond Neptune's orbit.

Now, "dwarf planet" may not sound so objectionable. But it's a classification that, despite how it reads, is not synonymous with "small planet" – and therein lies much of the trouble.

In the same confusing way that King Cobras are not actually cobras, dwarf planets are not, in fact, planets. They meet two of the three IAU criteria for a planet: They're round, and they orbit the sun. But unlike every world from Mercury through Neptune, the dwarfs haven't grown massive enough to dominate their orbits and clear those paths of other solar system debris, by either knocking it away or reeling it in with their gravity.

Jupiter has cleared its neighbourhood. Earth has cleared its neighbourhood. Ceres, which is in the main asteroid belt, hasn't. Pluto hasn't. A dwarf planet, according to the IAU definition, is not a type of planet. It is, one could say, just its own thing.

But what, exactly, is a planet? The definition has changed as new observations accrued, says Harvard astronomer and historian Owen Gingerich, who chaired the IAU committee charged with defining the word.

"'Planet' is a culturally defined word that has changed its meaning over and over again," Gingerich said during the Harvard debate. "My feeling is that, in retrospect, the IAU should not have attempted to define the word 'planet'."

Millennia ago, when the Greeks were staring at the stars and charting the heavens, there were seven planets: Mercury, Venus, Mars, Jupiter, Saturn, the sun, and the moon. Centuries later, after Copernicus redrew the solar system and placed the sun at its center, Earth became a planet, and the sun and moon lost their planethood.

By 1850, when Ceres and its contingent of rocky worlds in the realm between Mars and Jupiter were emerging from the darkness, they, too, were called planets. At the time, astronomy textbooks listed as many as 18 planets, and the tally threatened to grow as more were discovered.

"People said, 'This can't go on. We can't have these many planets. We've got to call them something else,'" Gingerich said...

And now, there are dwarf planets.

d) Pluto is smaller than most of the other worlds discovered in the solar system.

Number of words and Explanatory notes for RC:

Number of words: 490

Consider the first para: In 2006, the International Astronomical Union (IAU) _redefined "planet" and stripped Pluto_ of its planethood. _The basis of that decision: A number of other worlds have been discovered at the margins of the observable solar system, and Pluto might not even be the largest of these frosted runts_. Astronomers suspect there are hundreds more of these worlds waiting to be discovered.

Option A: Pluto's similarity to thousands of other frosted worlds is what led to the decision to strip Pluto of its planethood. Therefore, Option A wouldn't contradict the IAU decision. It merely restates the IAU's reasoning. Hence, Option A is not the answer.

Option B: This is irrelevant to the IAU decision. How many other worlds there are in our solar system has no bearing on whether Pluto should be a planet or not. Hence, Option B is not the answer.

Option C: IAU's decision is based on the assumption that if Pluto is similar to all the other worlds discovered, it cannot be the only one deemed a planet amongst all of them. But, if it is known that Pluto has a lot more in common with the planets than with those worlds (the frosted runts), then we have the answer to the question, 'How, then, could Pluto alone be called a planet?' Hence, Option C, if true, contradicts the IAU decision, and is therefore, the answer.

Option D: The main basis of the IAU decision to strip Pluto of its planethood is the large number of other frosted runts in the solar system, worlds similar to Pluto. If Pluto is smaller than the other worlds which have been discovered in the solar system, then there is all the more credibility in the IAU decision. Hence, Option D cannot contradict the IAU decision and is not the answer.   Choice (C)

Q23.   The 'trouble' the author is pointing to in the third para of the passage ('Now, "dwarf planet" …

and therein lies much of the trouble.') is:

a) **Planets should be round and must orbit around the sun.**

b) **The gravity of planets should be strong enough to draw in the solar system debris.**

c) **Dwarf planets are actually not planets.**

d) **Planets should grow massive enough to dominate their orbits.**

Q24.   The problem which Gingerich has with the IAU's definition of a planet is that:

 a) **it cannot be defined.**

 b) **it has too many definitions.**

 c) **it shouldn't have been defined.**

 d) **it has socio-cultural implications.**

Q25.   DIRECTIONS *for questions 25 and 26*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. Indeed, a certain wariness, even fearfulness, is detectable among creative writers and artists.
2. To many of us, it seemed that things could only get better; but we were wrong.
3. Although literature and the visual arts should flourish in liberal democracies, in several respects, they are now not flourishing.
4. Viewed from the perspective of the 1960s, the 70s and the 80s, this is an unanticipated reversal.

Q26. DIRECTIONS *for questions 25 and 26*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. In every age there have been people who considered that an individual had one overriding affiliation so much more important in every circumstance to all others that it might legitimately be called his "identity."
2. For some it was the nation, for others religion or class.
3. While there is always a certain hierarchy among the elements that go to make up individual identities, that hierarchy is not immutable; it changes with time, and in so doing brings about fundamental changes in behaviour.

4. But one has only to look at the various conflicts being fought out all over the world today to realize that no one allegiance has absolute superiority.

Sentence 1 talks about a generic idea – that of 'identity' of every individual. It is an independent sentence.
Sentence 2 gives an example of what 'identity' means to different people. The pronoun 'some' connects to 'people' in 1.
Sentence 3 talks about identities and introduces the idea of a hierarchy amidst the individual identities and how it can be changed. This idea counters 1 as well, in saying there is no predominant unchangeable hierarchy of identities.
Sentence 4 starts with a negative connector 'But' and introduces the idea of conflicts, probably between the various individual identities a person has allegiance to.
12 is a couple, given 2 is an example or specific case of 1. Identity in 1 could be nation, religion or class. Also, pronoun(some) should follow the noun (people) sentence. 4 gives a counter idea to 1. Which means it should follow the 12 couple for the 'But' to make sense. 124 is a block. 3 counters 1, but since 4 starts with 'But', 4 precedes 3.   Ans: (1243)

Q27. DIRECTIONS *for questions 27 and 28*: 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.

1. The art of writing was independently born in these four regions and I do not think it a coincidence that the advent of the written word was nourished by river water.
2. The Indus Valley, the Yellow River: these are the places where civilisations began, fed by sweet waters that in their flooding enriched the land.
3. There's hardly an age I can think of that's not associated with its own great waterway.
4. Rivers run through our civilisations like strings through beads.
5. The lands of the Middle East were once fertile, fed by the fruitful Euphrates and the Tigris, and the riches of Ancient Egypt stemmed from the Nile.

Q28. DIRECTIONS *for questions 27 and 28*: 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.

1. Freud lives on because science hasn't produced a mind-body paradigm potent enough to knock him off once and for all.

2. Just as the biological paradigm for understanding consciousness collapsed over the past two decades, so has the biological paradigm of psychiatry, which emphasised physiological rather than psychological causes and cures of mental illness.

3. Freud's critics are right, psychoanalysis is terribly flawed, but so are rival mind-body paradigms, including behaviourism, cognitive psychology, evolutionary psychology and behavioural genetics.

4. Neuroscience has generated voluminous findings, but theorists have failed to organize these data into a coherent, satisfying theory of the mind and brain.

5. But Freud's merits, such as they are, can't entirely account for his endurance, and that brings me to my why-Freud-isn't-dead thesis.

Q29.   DIRECTIONS *for question 29:* The following question consists of a highlighted sentence and two paragraphs from which the sentence may have been taken. The paragraphs have a total of five blanks numbered as (1), (2), (3), (4) and (5). Choose the number of the blank where the highlighted sentence can best be reinserted and key in that number in the input box provided below the question paragraphs.

If you think that the highlighted sentence is <u>contextually unrelated</u> or does not belong to the given paragraphs, then key in the number <u>0</u> as your answer in the input box.

To know something is one thing; but to know it with others, know that others know it, and know that they know that you know it, is another thing altogether.

_____(1)_____ One thing Kivas – a circular room with a bench formed out of straw and mud running around the perimeter – were used for is politics. When someone spoke in the Kiva, he could see his fellows and his fellows could see him. The circle also meant that his fellows could see each other seeing him; at a glance they could take in not only the speaker, but the faces of their colleagues doing the same. _____(2)_____ That matters because politics is not just what you think and believe. If I'm trying to do something that requires your cooperation I need to do more than say I'm willing. I need to know that you know I'm willing. _____(3)_____

In cognitive science, we call this common knowledge. _____(4)_____ It's what you need for costly cooperation. What teammates on the field and business partners in the boardroom signal when they look each other in the eye is a mental moment at the origin of society. Common knowledge is power. It is not enough to dislike a government; you need to know that others do too. _____(5)_____

Q30.   DIRECTIONS *for question 30*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. Their behaviour is often characterized by anger, and results in reciprocated aggression or severe depression in the other person.

2. The psychological position "I'm OK, You're not OK" is the result of a childhood in which parents blamed themselves for everything that went wrong, giving the child a false sense of superiority and invincibility, an impression that he is always right, almost perfect.

3. They often assume the role of the persecutor in adult life and play games to put down others, to rob them of their sense of self-worth and self-respect.

4. As grownups, people who operate from this life position blame and accuse others, refuse to see their own problems or the viewpoints of others, and often take dogmatic stands.

Q31.   DIRECTIONS *for question 31*: 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.

1. Earth generates a magnetic field that looks as if a bar magnet runs from the South Pole through its core to the North Pole.

2. This magnetosphere fends off charged particles hurtling toward us from space.

3. The field lines curve outward from both poles, far beyond the atmosphere, with the outer arcs forming the boundary of a magnetic bubble around our planet.

4. The sun's magnetic field alters the path traced by Earth's field lines, squashing the lines on our planet's dayside facing the sun and elongating the lines on the nightside, creating a magnetic tail.

5. Aurorae occur when charged particles spewed out by the sun break through the magnetosphere, accelerate along Earth's magnetic field lines toward the icy polar regions and release colorful photons that light up the sky when they collide with atoms and molecules of the atmosphere

Q32. DIRECTIONS *for question 32:* The following question consists of a highlighted sentence and two paragraphs from which the sentence may have been taken. The paragraphs have a total of five blanks numbered as (1), (2), (3), (4) and (5). Choose the number of the blank where the highlighted

sentence can best be reinserted and key in that number in the input box provided below the question paragraphs.

If you think that the highlighted sentence is <u>contextually unrelated</u> or does not belong to the given paragraphs, then key in the number <u>0</u> as your answer in the input box.

Ensuring compliance, however, will be difficult.

Transplant operations in China have long relied on organs taken from executed prisoners, a practice that has led to such abuses as the timing of executions to meet organ demand, with no notification of relatives. As the world's biggest user of the death penalty, China could count on an abundant supply. _____(1)_____ But in recent years, stung by international criticism, it has been trying both to reduce executions and to end the harvesting of organs from executed prisoners without their, or their families', consent. Since January 1st 2019, the government has insisted that no such organs be used for transplants. _____(2)_____

The number of executions is almost certainly falling, even if it remains far higher than in the rest of the world. _____(3)_____ The government does not release data, but the Dui Hua Foundation, an American NGO, reckons there were around 2,400 executions in 2013, down from 6,500 in 2007. _____(4)_____ In spite of the impact this has had on organ supply, the government still seems keen to sever the grim link between hospitals and courts that allows wealthy or well-connected patients to use organs from condemned prisoners. _____(5)_____

Q33.   DIRECTIONS *for question 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.

1.   The baths gradually fell into disrepair, but were rebuilt several times, culminating in the elaborate 18th century bathhouses that still stand today.

2. Archaeological evidence suggests that when the Romans first built a temple over the bubbling natural hot springs in Bath between 60-70 CE, they may have been adapting a previous center of worship by ancient Celts.

3. The ancient baths that lent the city Bath its name have for centuries drawn visitors here to Somerset, in South West England.

4. In any case, the Romans built a complex of bathhouses in Bath over the course of 300 years or so, until the Roman withdrawal from Britain in 410.

Q34. DIRECTIONS *for question 34:* The following question consists of a highlighted sentence and two paragraphs from which the sentence may have been taken. The paragraphs have a total of five blanks numbered as (1), (2), (3), (4) and (5). Choose the number of the blank where

the highlighted sentence can best be reinserted and key in that number in the input box provided below the question paragraphs.

If you think that the highlighted sentence is <u>contextually unrelated</u> or does not belong to the given paragraphs, then key in the number <u>0</u> as your answer in the input box.

Just imagine if it put as much effort into stopping murders.

_____(1)_____ The planet has rarely been so peaceful. Even with terrible fighting in such places as Congo, Syria and Yemen, wars between and within countries are becoming less common and less deadly. But a dark menace looms. Some of the developing world's cities threaten to be engulfed by murder. _____(2)_____

Of the 560,000 violent deaths around the world in 2016, 68% were murders; wars caused just 18%. _____(3)_____ Murder has been falling in rich countries (though London is suffering an outbreak), but it has long plagued Latin America and is starting to climb in parts of southern Africa, the Middle East and Asia. _____(4)_____The world often goes to great lengths to stop wars. _____(5)_____

DI/LR

Eight teams, A through H, participated in a football tournament, which comprised three knockout stages – quarterfinals, semi-finals and finals. In the quarterfinals, A played against B, C played against D, E played against F and G played against H. In the semi-finals, A played against D and F played against H. In the finals, D and F played against each other.

If any match in any stage ended as a draw, the two teams involved will play a re-match against each other. If the re-match also ends in a draw, the two teams play another re-match against each other, and in this way, the two teams continue the re-matches until one of them wins (i.e., until any team wins one of the re-matches).

A total of 17 goals were scored in the quarterfinals; a total of 10 goals were scored in the semi-finals and a total of 5 goals were scored in the finals. In each match, each team scored at least one goal and, in each match, each team scored at most two goals more than its opponent.

Q1.   DIRECTIONS *for questions 1 to 4:* Type in your answer in the input box provided below the question.

What is the maximum number of goals that F could have scored in the tournament?

Q2.   DIRECTIONS *for questions 1 to 4:* Type in your answer in the input box provided below the question.

If, in every match that D won, D scored exactly x goals, what is the maximum possible value of x?

Q3. DIRECTIONS *for questions 1 to 4:* Type in your answer in the input box provided below the question.

If in each stage, at least one match ended in a draw, what is the maximum number of goals that were scored in any match?

Q4. DIRECTIONS *for questions 1 to 4:* Type in your answer in the input box provided below the question.

If the total number of goals scored by A was not less than that scored by D, what is the maximum number of goals that F could have scored?

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

Each of five friends, Ankit, Balu, Hari, Trivedi and Praveen, uses a different password for his laptop. Each password comprises exactly five letters from the alphabet. Further, no letter appears in more than one of the five passwords and the letters in each password appear in the alphabetical order, from left to right.

Each of the five friends revealed the following information about his password:

Q5. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.

Which of the following is the last letter of Ankit's password?

a) **S**

b) **T**

c) **V**

d) **Q**

Q6. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.

Which of the following is the last letter of Balu's password?

a) **Q**

b) **V**

c) **H**

d) **N**

Q7. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.

In the password of which of the following persons does the letter Z appear?

a) **Ankit**

b) **Balu**

c) **Praveen**

d) **Trivedi**

Q8.   DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.

For which of the following sets of letters can it be said that each letter in the set appears in the password of a different person?

a) **BCDE**

b) **GHIJ**

c) **NOPQ**

d) **PQRS**

From the information given on Ankit's password, the first letter is G.

Since the number of letters in the alphabet between any two consecutive letters in his password is the same, we can try various possibilities for the number of letters between any two consecutive letters (say n) in his password.

If n = 0, i.e., if they are consecutive, the password will be GHIJK. But this has a vowel. Hence, this is not possible.

If n = 1, the second letter of the password will be I. Hence, this is also not possible.

If n = 2, the password will be GJMPS.

If n = 3, the third letter of the password will be O.

If n ≥ 4, there cannot be five letters in the password.

Hence, the password of Ankit must be GJMPS.

For Balu, the first three letters can be DEF or HIJ or NOP or TUV. Of these, HIJ and NOP are not possible as they are present in Ankit's password.

Hence, it must be DEF or TUV. However, if it is TUV, the fourth letter of the password must be the fifth letter after V, which is not possible (as the alphabet ends at Z).

Hence, the first three letters must be DEF. The fourth letter must be K.

For Trivedi, O and U are present in the password. There are five letters between O and U. If there were five letters between any two consecutive letters in a password, there cannot be five letters in the password.

The only other possibility is that there are two letters between any two consecutive letters in the password. In this case, the letters in his password can be I, L, O, R, U and X. There are two possibilities for his password – ILORU and LORUX. However, Hari's password has the letter X. Hence, Trivedi's password must be ILORU.

For Hari, the letters T and X are the fourth and fifth letters of the password. The only way for three consecutive letters to be in Hari's password is to have A, B and C. Hence, Hari's password must be ABCTX.

The remaining letters are HNQVWYZ. Of these, Praveen's password does not have H and N. Hence, Praveen's password must be QVWYZ.

The last letter of Balu's password must be N (it cannot be H as the letters in the password are in alphabetical order.

The following table provides the passwords of the five persons:

| Person	Password
Ankit	GJMPS
Balu	DEFKN
Trivedi	ILORU
Hari	ABCTX
Praveen	QVWYZ

Each of N, O, P and Q is present in a different password.   Choice (C)

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

Tarun followed the price of a commodity during the year 2018. He recorded the price of the commodity exactly once every month. The day of the month on which he recorded the commodity price was not necessarily the same in every month, but he recorded the price of the commodity at least once every 40 days. It is known that the price of the commodity remained the same over the course of any day, but the price can change from one day to the next. Further, the price of the commodity did not change by more than Re. 1 on any day as compared to the previous day.

The following line chart provides the price of the commodity that he recorded in each month:
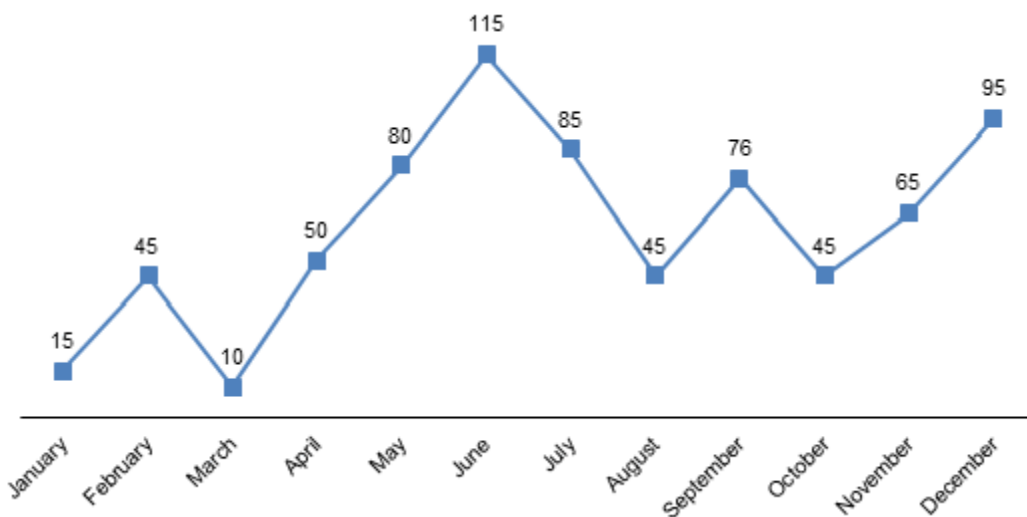
Q9. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.

On which day in April did Tarun record the price of the commodity?

a) **17th**

b) **20th**

c) **24th**

d) **11th**

Let the day on which he recorded the price in January be d.

Since the price increased by ₹30 when he recorded it in February, at least 30 days must have passed between the day on which he recorded the price in January and the price in February. In January, if he recorded the price on 1st, then he must have waited for 31 days to record the price on February 1st. For any other day in January, he must have waited a minimum of 30 days to record the price in February.

Hence, in February, he must have recorded the commodity price between d + 30 and d + 40 (since he recorded the price once every 40 days).

In March, the price difference was 35. Hence, he must have recorded the price between d + 65 and d + 80.

In April, the price difference was 40. Hence, he must have recorded the price between d + 105 and d +120. However, d + 120 at the earliest can be May 1st, as there are only 120 days till April. Hence, he must have recorded the price between d + 105 and d + 119.

In May, the price difference was 30. Hence, he must have recorded the price between d + 135 and d + 160. However, d + 160 will not be in May (as till May, there are only 151 days). Hence, he must have recorded the price between d + 135 and d + 150.

In June, the price difference was 35. Hence, he must have recorded the price between d + 170 and d + 180 (since there are only 181 days till June).

In July, the price difference was 30. In July, he must have recorded the price between d + 200 and d + 211.

In August, the price difference was 40. In August, he must have recorded the price between d + 240 and d + 242.

In September, the price difference was 31. In September, he must have recorded the price between d + 271 and d + 272.

If he recorded the price in September on d + 271, then he must have recorded the price in January on d and in February on d + 30 (as this is the minimum possible case). However, in this case, he must have recorded in January on or after 2nd. This is because if he recorded in January on 1st, then after 30 days, it would still be January. Hence, d must be at least 2. Hence, he must have recorded the price in September on 30th (i.e., the 273rd day).

Even if he recorded the price on January 1st, he must have recorded the price on February 1st for him to be able to record the price on September.

Hence, we can find the days on which he recorded the price for each month till September.

In January, he could have recorded on January 1st or 2nd. In February, the earliest that he could have recorded on **February 1st**. In March, the earliest that he could have recorded on is **March 8th**. In April, the earliest that could have recorded on is **April 17th**. In May, the earliest that could have recorded on is **May 17th**. In June, the earliest that could have recorded on is **June 21st**. In July, the earliest that he could have recorded on is **July 21st**. In August, the earliest that he could have recorded on is **August 30th**. In September, the earliest that he could have recorded on is **September 30th**. Since he must have recorded at least once in each month, these must be the dates on which he recorded the price in each month.

Since the price difference in October is 31, he must have recorded in **October on 31st**.

In November, the price difference was 20. Hence, he must have recorded the price between **November 20th and 30th**.

In December, the price difference was 30. Hence, he must have recorded the price between **December 20th and December 31st**.

The following table provides the dates for each month on which he recorded the price:

Month	Date Range
January	1st or 2nd
February	1st
March	8th
April	17th
May	17th
June	21st
July	21st
August	30th
September	30th
October	31st
November	20th to 30th
December	20th to 31st

Tarun recorded the price of the commodity on April 17th.   Choice (A)

Q10.   DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.

On which day in October did Tarun record the price of the commodity?

a) **20th**

b) **25th**

c) **28th**

d) **31st**

On which day in June was the price of the commodity the highest for that month?

a) **15th**

b) **18th**

c) **27th**

d) **21st**

Q12.   DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.

For how many months in 2018 can it be said that the price of the commodity decreased on at least one day of the month as compared to the previous day?

a) **4**

b) **5**

c) **6**

d) **7**

Let the day on which he recorded the price in January be d.
Since the price increased by ₹30 when he recorded it in February, at least 30 days must have passed between the day on which he recorded the price in January and the price in February. In January, if he recorded the price on 1st, then he must have waited for 31 days to record the price on February 1st. For any other day in January, he must have waited a minimum of 30 days to record the price in February.
Hence, in February, he must have recorded the commodity price between d + 30 and d + 40 (since he recorded the price once every 40 days).
In March, the price difference was 35. Hence, he must have recorded the price between d + 65 and d + 80.
In April, the price difference was 40. Hence, he must have recorded the price between d + 105 and d +120. However, d + 120 at the earliest can be May 1st, as there are only 120 days till April. Hence, he must have recorded the price between d + 105 and d + 119.
In May, the price difference was 30. Hence, he must have recorded the price between d + 135 and d + 160. However, d + 160 will not be in May (as till May, there are only 151 days). Hence, he must have recorded the price between d + 135 and d + 150.
In June, the price difference was 35. Hence, he must have recorded the price between d + 170 and d + 180 (since there are only 181 days till June).
In July, the price difference was 30. In July, he must have recorded the price between d + 200 and d + 211.
In August, the price difference was 40. In August, he must have recorded the price between d + 240 and d + 242.
In September, the price difference was 31. In September, he must have recorded the price between d + 271 and d + 272.
If he recorded the price in September on d + 271, then he must have recorded the price in January on d and in February on d + 30 (as this is the minimum possible case). However, in this case, he must have recorded in January on or after 2nd. This is because if he recorded in January on 1st, then after 30 days, it would still be January. Hence, d must be at least 2. Hence, he must have recorded the price in September on 30th (i.e., the 273rd day).
Even if he recorded the price on January 1st, he must have recorded the price on February 1st for him to be able to record the price on September.
Hence, we can find the days on which he recorded the price for each month till September.

In January, he could have recorded on January 1st or 2nd. In February, the earliest that he could have recorded on **February 1st**. In March, the earliest that he could have recorded on is **March 8th**. In April, the earliest that could have recorded on is **April 17th**. In May, the earliest that could have recorded on is **May 17th**. In June, the earliest that could have recorded on is **June 21st**. In July, the earliest that he could have recorded on is **July 21st**. In August, the earliest that he could have recorded on is **August 30th**. In September, the earliest that he could have recorded on is **September 30th**. Since he must have recorded at least once in each month, these must be the dates on which he recorded the price in each month.
Since the price difference in October is 31, he must have recorded in **October on 31st**. In November, the price difference was 20. Hence, he must have recorded the price between **November 20th and 30th**.
In December, the price difference was 30. Hence, he must have recorded the price between **December 20th and December 31st**.
The following table provides the dates for each month on which he recorded the price:

Month	Date Range
January	1st or 2nd
February	1st
March	8th
April	17th
May	17th
June	21st
July	21st
August	30th
September	30th
October	31st
November	20th to 30th
December	20th to 31st

In the month of January, the price should have increased from 15 to 45. Since on each day, the price can increase by Re. 1, on one day in January the price need not have increased. However, if the price had decreased, say by ₹0.50, on that one day, the overall price increase in the month of January can be a maximum of ₹29.5. Hence, the price could not have decreased in the month of January.
In February, March, June, July, August and October, the price must have decreased on at least one day.
In November, the increase in price (from 45 to 65) requires only 20 days. Hence, in the remaining days, the price could have decreased. Also, in December, the increase in price requires 30 days. However, in November and December combined, the increase in price is ₹50, the price could have decreased or remained the same on ten days.
∴ The price must have decreased in six months – February, March, June, July, August and October. Choice (C)

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

The following pie charts provide the percentage share of revenue of eight companies, A through H, for the years 2017 and 2018:

Q13. DIRECTIONS *for questions 13 to 16:* Select the correct alternative from the given choices.

If the revenue of E in 2017 was 20% more than that in 2018, what is the percentage increase in the revenue of G from 2017 to 2018?

a) **54.74%**

b) **48.96%**

c) **52.38%**

d) **56.22%**

Q14. DIRECTIONS *for questions 13 to 16:* Select the correct alternative from the given choices.

If the number of companies whose revenues remained unchanged from 2017 to 2018 is x, what is the maximum possible value of x?

a) **1**

b) **2**

c) **3**

d) **0**

Q15. DIRECTIONS *for questions 13 to 16:* Select the correct alternative from the given choices.

If the revenue of exactly two companies did not increase from 2017 to 2018, what is the minimum possible ratio of the revenue of company G in 2017 to that in 2018?

a) 0.567

b) 0.578

c) **0.529**

d) 0.547

Let the total revenue of the eight companies in 2017 be X and that in 2018 be Y.

For the revenue of A to not increase from 2017 to 2018, $0.07X \geq 0.10Y \Rightarrow X/Y \geq 10/7$ $\Rightarrow X/Y \geq 1.4286$.
Hence, for any value of X greater than 1.4286Y, the revenue of A will not increase.
For the revenue of B to decrease from 2017 to 2018, $X/Y \geq 13/16 \Rightarrow X/Y \geq 0.8125$.
Hence, for any value of X greater than 0.8125Y, the revenue of B will decrease.
Note that if the revenue of A decreases, the revenue of B will also decrease (as the condition for B will satisfied).
Similarly, for C through H, the value of X/Y must be greater than 1.25, 0.8947, 0.875, 1.25, 1.6 and 0.846 respectively.
On comparison we can see that if the condition for A is satisfied ($X/Y \geq 1.4286$), the condition for B, C, D, E, F and H will also satisfy.
For only two companies to have a decrease in revenue, we need to look at the least two values, i.e., 0.8125 and 0.846. Hence, if $X/Y \geq 0.846$, the revenue of B and H will decrease. The third lowest value is 0.875. If X/Y is greater than this, then there will be three companies whose revenue will decrease (B, H and E). Hence, the value of X/Y must be between 0.846 and 0.875.
The ratio of revenue of G in 2017 to 2018 can be minimized if we take X/Y to be minimum.
Minimum possible ratio = $0.05X/0.08Y = 5/8 \times 0.846 = 0.52875$ Choice (C)

Q16.   DIRECTIONS *for questions 13 to 16:* Select the correct alternative from the given choices.

If the revenue of exactly two companies did not decrease from 2017 to 2018, what is the minimum possible ratio of the revenue of company B in 2018 to that in 2017?

a) 0.5687

b) 0.5257

c) **0.5514**

d) 0.5967

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

Eight cities, A through H, are connected by a network of two-way roads as shown in the figure below:

Kiran, a travelling salesman, has to travel from one of the eight cities to another, such that he visits each of the eight cities exactly once. The city from which he starts is referred to as the origin, while the city that he finally reaches is referred to as the destination.

Q17. DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.

If B must be the third city that Kiran visits (counting the origin as the first city), which of the following can be his destination?

a) **G**

b) E

c) **F**

d) A

> Given that B was the third city that he visited. For B to be the third city, the first two cities can be C-A or C-D or F-D.
> If the first two cities are C and A, from B, he has to go to D. From D, he has to go to F. From F, he can go to E or G. If he goes to E, then from E he can go only to one city between G and H. Hence, from F, he has to go to G. From G to E and from E to H. Hence, his route in this case will be C-A-B-D-F-G-E-H.
> If the first two cities are C and D, from B he has to go to A. From A, he has to go to C again, which is not possible. Hence, the first two cities cannot be C and D.
> If the first two cities are F and D, he has to go from B to A to C to H to E to G. Hence, the route will be F-D-B-A-C-H-E-G.
> From the given options, the last city that he visits can be G.   Choice (A)

Q18. DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.

Which of the following pairs of cities cannot be the last two cities that he visits?

a) **C, D**

b) E, F

c) **D, F**

d) **More than one of the above**

If C and D are the last two cities that he visits, then before visiting C and D, he could have visited H, E, G and F OR A and B but not both. Hence, C and D cannot be the last two cities that he visited.

If E and F are the last two cities that he visited, then he could not have visited G (as it is accessible only from E and F). Hence, these cannot be the last two cities that he visits.

If D and F are the last two cities that he visited, he could have visited the cities in the order G-E-H-C-A-B-D-F.

Hence, more than one of the given options cannot be the last two cities that he visited.

Choice (D)

Q19.   DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.

If the origin is E, how many of the other seven cities can be the destination?

a) **0**

b) 1

c) **2**

d) **3**

Q20.   DIRECTIONS *for questions 17 to 20:* Select the correct alternative from the given choices.

If the origin and the destination should not be directly connected, how many of the eight cities can be the origin?

a) **4**

b) 5

c) **3**

d) **6**

Six candidates, Lalit, Hari, Wasim, Shoaib, Gautam and Jatin, were waiting in a hall for their interviews. In the hall, there were six chairs, in a straight line, numbered 1 to 6, from left to right. The six candidates were initially sitting in these six chairs, not necessarily in any particular order. The candidates were then called for their interviews one after the other, not necessarily in any particular order. However, since there was more than one interview panel, it is possible that at any point of time, more than one candidate was giving his interview. Each candidate, immediately after his interview, came back to the hall and sat in the lowest numbered chair which was empty. It is known that no candidate sat in the same chair before and after his interview.

The duration of Hari's interview was the longest, followed by Jatin's, Gautam's, Shoaib's, Wasim's and Lalit's, in that order. The order in which they were called for the interview was Lalit, Shoaib, Gautam, Jatin, Wasim and Hari. It is known that, at any point of time after the first candidate was called for his interview, at least four and at most five of the six chairs were occupied, until the last interview was finished. It is also known that, for Shoaib and Lalit, the total number of distinct chairs that either of them sat in at any point of time was exactly two. The same was the case for Gautam and Jatin and also for Hari and Wasim.

Who sat in the chair numbered 6 initially?

a) **Hari**

b) Lalit

c) **Wasim**

d) **Gautam**

Q22.   DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.

Which of the following pairs of candidates definitely did not sit adjacent to each other initially?

a) **Shoaib, Hari**

b) Jatin, Lalit

c) **Shoaib, Gautam**

d) **Hari, Wasim**

Q23. DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.

It is known that no candidate who initially sat adjacent to Gautam was sitting adjacent to Gautam after the last interview was finished. Further, Jatin did not sit in the chair numbered 1 initially.

Who sat in the chair numbered 3 initially?

a) **Lalit**

b) Jatin

c) **Shoaib**

d) **Hari**

Q24. DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.

It is known that no candidate who initially sat adjacent to Gautam was sitting adjacent to Gautam after the last interview was finished. Further, Jatin did not sit in the chair numbered 1 initially.

Who was sitting in the chair numbered 2, after the last interview was finished?

 a) **Gautam**

 b) Jatin

 c) **Shoaib**

 d) **Lalit**

Before the first person was called for the interview, all the six persons would have occupied the chairs in some order. Let the numbers of the chairs that the six person occupied by l, h, w, s, g and j.

The first person to go for the interview was Lalit. The second person would have been called before Lalit's interview was finished because after the first person was called for the interview, all the six of them were not present in the hall. Hence, Shoaib would have been called for the interview before Lalit's interview was finished.

Before the next person, i.e., Gautam, could be called for the interview, one of these two persons must have returned to the hall. Since the duration of Lalit's interview was less than that of Shoaib (and Lalit was called first), Lalit would have returned. Since Lalit and Shoaib sat in exactly two distinct chairs and no person sat in the same chair twice, Lalit must have chosen Shoaib's chair. This implies that Shoaib's chair has a lower number than Lalit's chair. Hence, s < l.

Following this, Gautam would have been called for the interview. Shaoib's interview must have been finished before Gautam's because Gautam should have sat in Jatin's chair, which is still occupied. Hence, Shoaib would have returned and sat in Lalit's chair. Since Shoaib chose Lalit's chair over Gautam's chair, Lalit's chair must have lower number than Gautam's chair. Hence, s < l < g.

The next person, Jatin, would have been called for the interview next. Since Jatin's interview was longer, Gautam would have returned next and chose Jatin's chair (since Gautam and Jatin sat in two distinct chairs). Hence, Jatin's chair has lower number than Gautam's chair. Hence, j < g.

The next person that would have been called for the interview would be Wasim. After Wasim left the hall, Jatin's interview would have been finished and he would have chosen Gautam's chair. Hence, Gautam's chair has lower number than Wasim's chair. Hence, s < l < g < w and j < g < w.

Hari would have been called for interview next and since Wasim's interview was shorter, Wasim would have returned. Wasim would have chosen Hari's chair over Wasim's chair. Hence, h < w.

From these three inequalities, s < l < g < w, j < g < w and h < w, we get the following possibilities for the numbers of the chairs in which they initially sat:

Person	Chair Number
Wasim	6
Gautam	4/5
Lalit	2/3/4
Shoaib	1/2/3
Jatin	1/2/3/4
Hari	1/2/3/4/5

After the six interviews, Gautam was sitting in chair numbered 2.   Choice (A)

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

Ramesh and Suresh are two security guards who work at a museum. The museum has only one entrance gate and one exit gate, for the visitors.

On a particular day, Ramesh and Suresh were both standing guard near the entrance of the museum. On that day, the colour of the hair of any visitor was one among Black, Brown, Grey and White. Further, the colour of the shoes of any visitor was one among Black, Brown, Blue and Red.

At the end of that day, Ramesh observed that there were exactly 50 visitors with Black hair, 40 visitors with Brown hair, 70 visitors with Grey hair and 60 visitors with White hair. Suresh observed that there were exactly 40 visitors wearing Black shoes, 70 visitors wearing Brown shoes, 50 visitors wearing Blue shoes and 60 visitors wearing Red shoes.

On further discussion, they also found that

i.   among the visitors with Black hair, 5 visitors wore Black shoes.
ii. among the visitors wearing Red shoes, the number of visitors with Grey hair was 20 more than the number of visitors with Brown hair.
iii. among the visitors with Grey hair, the number of visitors wearing Blue shoes was 5 less than the number of visitors wearing Black shoes.
iv. among the visitors with Brown hair, the number of visitors wearing Red shoes was the same as the number of visitors wearing Brown shoes.
v.   no visitor who had White hair wore Blue shoes and no visitor who wore Black shoes had Brown hair.
vi. the number of visitors with White hair who wore Black shoes was the same as the number of visitors with White hair who wore Brown shoes, which, in turn, was 20 less than the number of visitors with Brown hair who wore Blue shoes.

Q25. DIRECTIONS *for questions 25 to 27:* Type in your answer in the input box provided below the question.

How many visitors have Black hair and wore Blue shoes?

From (i) and (v), we can fill the following information:

Shoes / Hair	Black	Brown	Blue	Red	Total
Black	5				50
Brown	0				40
Grey					70
White			0		60
Total	40	70	50	60	220

Let the number of persons with Red shoes and Brown hair be x. From (ii), the number of persons with Red shoes and Grey hair will be x + 20.

From (iv), the number of persons with Brown hair wearing Brown shoes is also x.

Since the total number of persons with Brown hair is 40, the number of persons with Brown hair wearing Blue shoes = 40 – x – x = 40 – 2x

From (vi), the number of persons with White hair who wore Brown shoes will be 20 – 2x (since this is 20 less than the number of persons with Brown hair wearing Blue shoes).

Also from (vi), the number of persons with White hair who wore Black shoes will also be 20 – 2x.

Since the total number of persons with White hair is 60, the number of persons with White hair wearing Red shoes = 60 – 20 + 2x – 20 + 2x = 20 + 4x

Since the total number of persons wearing Black shoes is 40, the number of persons with Black shoes and Grey hair = 40 – 5 – 20 + 2x = 2x + 15

From (iii), the number of persons with Grey hair wearing Blue shoes = 2x + 10 (since this is 5 less than the number of persons with Grey hair wearing Black shoes).

Since the total number of persons with Grey hair is 70, the number of persons with Grey hair wearing Brown shoes
= 70 – 2x – 15 – 2x – 10 – x – 20 = 25 – 5x

Since the total number of persons wearing Brown shoes is 70, the number of persons with Brown shoes and Black hair
= 70 – x – 25 + 5x – 20 + 2x = 6x + 25

Since the total number of persons wearing Blue shoes is 50, the number of persons with Blue shoes and Black hair
= 50 – 40 + 2x – 2x – 10 = 0.

The number of persons with Red shoes and Black hair
= 20 – 6x.

This is presented in the following table:

Shoes / Hair	Black	Brown	Blue	Red	Total
Black	5	6x + 25	0	20 – 6x	50
Brown	0	x	40 – 2x	x	40
Grey	2x + 15	25 – 5x	2x + 10	x + 20	70
White	20 – 2x	20 – 2x	0	4x + 20	60
Total	40	70	50	60	220

The number of persons with Black hair who wore Blue shoes is 0.   Ans: (0)

Q26.   DIRECTIONS *for questions 25 to 27:* Type in your answer in the input box provided below the question.

What is the total number of visitors who did not wear Blue shoes but had either Brown hair or Grey hair?

Q27.   DIRECTIONS *for questions 25 to 27:* Type in your answer in the input box provided below the question.

What is the maximum number of visitors with Black hair who wore Brown shoes?

Q28. DIRECTIONS *for question 28:* Select the correct alternative from the given choices.

Which of the following statements is true?

 a) **The number of visitors with Black hair who wore Brown shoes can be the same as the number of visitors with Grey hair who wore Blue shoes.**

 b) The number of visitors with Black hair who wore Black shoes can be the same as the number of visitors with White hair who wore Black shoes.

 c) **The number of visitors with Brown hair who wore Blue shoes can be the same as the number of visitors with Grey hair who wore Red shoes.**

 d) **The number of visitors with Black hair who wore Brown shoes can be the same as the number of visitors with Grey hair who wore Brown shoes**

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

Five friends, Shankar, Rahman, Ehsaan, Jatin and Lalit, went to a mall to watch a movie, the duration of which was exactly 120 minutes. The five friends initially entered the movie theatre, one after the other, at different times and each of the five friends entered the theatre only after the movie started. Further, during the movie, each friend went out of the theatre for a break, at a different time, and re-entered the theatre. Immediately after the end of the movie, all of them exited the theatre at the same time.

It is also known that

i.   Shankar, who entered the theatre immediately after Jatin initially, was in the theatre for a total of 90 minutes.

ii. the time spent by each friend in the theatre between entering the theatre initially and going out for a break was the same.

iii. the total time spent by Ehsaan in the theatre was five minutes more than that spent by Lalit.

iv. the last person to initially enter the theatre was Ehsaan, while Rahman was the third person to initially enter the theatre.

v.   Rahman took a break for 15 minutes, while Jatin took a break for exactly 20 minutes.

vi. the total time spent by Rahman in the theatre was 75 minutes, while the total time spent by Lalit in the theatre was 60 minutes.

vii. except for the first friend who initially entered the theatre, every friend initially entered the theatre ten minutes after the previous friend initially entered.

Q29.   DIRECTIONS *for question 29:* Select the correct alternative from the given choices.

Who was the last friend to re-enter the theatre after taking a break?

a) **Lalit**

b) Ehsaan

c) **Shankar**

d) **Rahman**

From (i), Shankar first entered the theatre immediately after Jatin. From (iv), the last person to enter the theatre was Ehsaan and the third person to enter the theatre was Rahman. Hence, Jatin must be the first person to enter the theatre and Shankar must be the second person to enter the theatre.

The fourth person to enter the theatre must be Lalit.

From (ii), the time spent by each person after entering and before going for a break is the same. Hence, the five persons must have gone for break in the same order as they entered the theatre – Jatin, Shankar, Rahman, Lalit and Ehsaan.

From (v), Rahman took a break for 15 minutes and from (v), Rahman spent a total of 75 minutes in the theatre.

Out of the 120 minutes, Rahman was in the theatre for 75 minutes. Hence, he was not in the theatre for 45 minutes. Of these 45 minutes, he took a break for 15 minutes. Hence, he must have entered the theatre 30 minutes after the movie started.

From (vii), Jatin must have entered the theatre 10 minutes after the movie started, Shankar must have entered the theatre 20 minutes after the movie started and so on.

From (i), Shankar was in the theatre for 90 minutes. Hence, he must have taken a break for 10 minutes. From (v), Jatin took a break for 20 minutes. Hence, he must have spent a total of 90 minutes in the theatre.

From (vi), Lalit spent 60 minutes in the theatre. Hence, he must have taken a break for 20 minutes. From (iii), Ehsaan must have spent 65 minutes in the theatre. Hence, he must have taken a break for 5 minutes.

Let the time at which the movie started be labelled 0th minute and the time for which each person was in the theatre between first entering the theatre and going out for a break be x minutes.

The following table provides the time at which each person entered the theatre, went out for a break and came back to the theatre:

Person	Entry Time	Break Start	Break End
Jatin	10th minute	$(x + 10)^{th}$ minute	$(x + 30)^{th}$ minute
Shankar	20th minute	$(x + 20)^{th}$ minute	$(x + 30)^{th}$ minute
Rahman	30th minute	$(x + 30)^{th}$ minute	$(x + 45)^{th}$ minute
Lalit	40th minute	$(x + 40)^{th}$ minute	$(x + 60)^{th}$ minute
Ehsaan	50th minute	$(x + 50)^{th}$ minute	$(x + 55)^{th}$ minute

Lalit was the last person to enter the theatre after taking a break.   Choice (A)

Q30.   DIRECTIONS *for question 30:* Type in your answer in the input box provided below the question.

What is the maximum total time (in minutes) spent by any friend in the theatre?

Q31.   DIRECTIONS *for questions 31 and 32:* Select the correct alternative from the given choices.

The movie started at 10:00 AM. At 10:30 AM, exactly three of the five friends were in the theatre, while at 10:35 AM, exactly two of the five friends were in the theatre.

At which of the following times was Lalit definitely not in the theatre?

 a) **11:01 AM**

b) 11:24 AM

c) **11:04 AM**

d) **11:14 AM**

Q32.   DIRECTIONS *for questions 31 and 32:* Select the correct alternative from the given choices.

The movie started at 10:00 AM. At 10:30 AM, exactly three of the five friends were in the theatre, while at 10:35 AM, exactly two of the five friends were in the theatre.

At which of the following times were there definitely more than four friends in the theatre?

a) **10:50 AM**

b) 11:00 AM

c) **11:05 AM**

d) **11:15 AM**

QUANTS

DIRECTIONS *for questions 1 and 2:* Select the correct alternative from the given choices.

If the roots of the quadratic equation $x^2 + bx + c = 0$ are consecutive even integers, find the value of its discriminant.

a) 1

b) **4**

c) **16**

d) Cannot be determined

Let the roots of the quadratic equation be $2k$ and $2k+2$
∴ The quadratic equation is
$x^2 - (4k+2)x + 2k(2k+2) = 0$
The discriminant $= (4k+2)^2 - 4(1)(2k)(2k+2)$
$= 16k^2 + 16k + 4 - 16k^2 - 16k = 4$

Alternative Solution 1:

If the roots of $x^2 + bx + c = 0$ are consecutive even integers, the difference of the roots $= 2$.

$$\text{Hence} \left[\left(\frac{-b + \sqrt{b^2 - 4c}}{2} \right) - \left(\frac{-b - \sqrt{b^2 - 4c}}{2} \right) \right],$$

i.e., $\sqrt{b^2 - 4c} = 2$
$\Rightarrow b^2 - 4c$ (i.e., discriminant) $= 4$.

Alternative Solution 2:

Trying a few examples like $(x - 2)(x - 4) = 0$; $(x - 4)(x - 6) = 0$; $(x - 8)(x - 10) = 0$ etc., will show that the discriminant is always equal to 4.　　　　　　　　Choice (B)

DIRECTIONS *for questions 1 and 2:* Select the correct alternative from the given choices.

Find the value of k for which the following pair of equations have an infinite number of solutions for (x, y).

$3x + 5y = 24$

$ky + 4x = 32$

a) **4**

b) $2\frac{2}{5}$

c) $6\frac{2}{3}$

d) 8

$3x + 5y = 24$ and $4x + ky = 32$ will have infinite number of solutions if, $\dfrac{3}{4} = \dfrac{5}{k} = \dfrac{24}{32}$,

$\Rightarrow k = \dfrac{20}{3} = 6\dfrac{2}{3}$ 　　　　　　　　　　　　　　Choice (C)

Q3. DIRECTIONS *for question 3:* Type in your answer in the input box provided below the question.

If N is a natural number greater than 29, how many of the following numbers always divide $N(N^2 - 1)$ $(N^2 - 4) (N^2 - 9)$?

   I.   5040

   II. 2520

   III. 1680

   IV. 1320

The given expression is nothing but $(N - 3) (N - 2) (N - 1) (N) (N + 1) (N + 2) (N + 3)$, which is always divisible by $7! = 5040$.
Now, 2520 and 1680 are also factors of 5040 but 1320 is not.
Hence 5040, 2520, and 1680 always divide the given expression. 　　　　Ans: (3)

Q4. DIRECTIONS *for question 4:* Select the correct alternative from the given choices.

The equation $mx + ny + p = 0$, where $4m + 5n + 2p = 0$, represents a set of concurrent lines, of which one passes through the origin. What is the equation of that line?

a) **$5y + 4x = 0$**

b) **$4y - 5x = 0$**

c) **$5x + 4y = 0$**

d) $5y - 4x = 0$

Let $Mx + Ny + P = 0$ represent the line that passes through the origin. Hence $P = 0$ for this line. Also $4M + 5N + 2P = 0$.

Hence $M = \dfrac{-5N}{4}$, i.e., the required equation is

$\dfrac{-5N}{4}x + Ny = 0 \Rightarrow 4y - 5x = 0$ Choice (B)

Q5. DIRECTIONS *for question 5:* Type in your answer in the input box provided below the question.

Find the percentage profit made on an item, if its cost price is first marked up by 50% and then it is sold at a discount of 20%.

Let the cost price of the item be 100
Given mark up = 50%
$\Rightarrow$ The marked price = 150
Given, discount = 20%
$\Rightarrow$ selling price = 150 – 20% of 150
= 150 – 30 = 120
$\therefore$ profit = 20 on a C.P. of 100, i.e., 20%   Ans: (20)

Q6. DIRECTIONS *for questions 6 and 7:* Select the correct alternative from the given choices.

Pavan, Mohan and Sohan were three friends. Pavan bought a cornetto, which is a large ice-cream in the shape of a perfect cone. He first had the top $70\dfrac{10}{27}$ % of it, by volume, and then gave it to

Mohan. Mohan then had the top $70\frac{10}{27}$ %, by volume, of the remaining part and gave the rest to Sohan. The level of the ice-cream then was 4 cm from the bottom, i.e., the vertex. Find the height of the initial cone (in cm).

a) **8.1**

b) **9.9**

c) **9**

d) 7.2

In the figure below the ice-cream cone has been inverted.
Percentage of ice cream remaining when Pavan finished having it

$$= 100\% - 70\frac{10}{27}\% = 29\frac{17}{27}\% \quad 29\frac{17}{27}\% = \frac{8}{27}$$

∴ Height of the ice cream then $= \sqrt[3]{\frac{8}{27}} = \frac{2}{3}$ of initial height.

(Because, the volumes of two similar cones, i.e., with same vertex angle, are in the ratio of the cubes of their heights (or base radii))

Similarly height of the ice cream finally remaining $= \frac{2}{3}$ of the height of the ice cream

remaining when Pavan finished it $= \frac{2}{3}\left(\frac{2}{3}\right)$ (Initial height) $= \frac{4}{9}$ (Initial height) = 4 cm.

∴ Initial height = 9 cm.   Choice (C)

Q7.   DIRECTIONS *for questions 6 and 7:* Select the correct alternative from the given choices.

The pair of straight lines $y^2 = 2x^2$ meet the graph of $y^2 = 4x$ at the origin and also at points P and P', forming two closed loops. The ratio of the area of the upper loop to that of the lower loop is
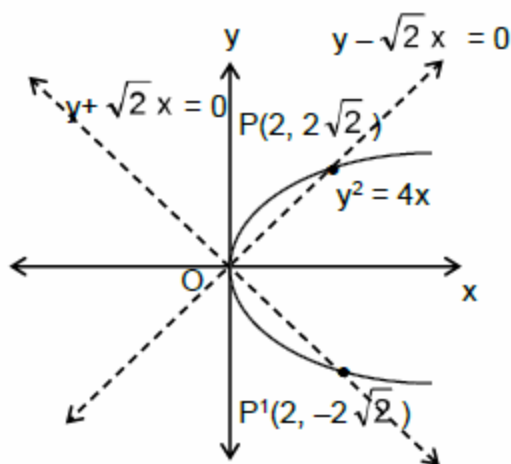
a) **1 : 2.**

b) **2 : 1.**

c) **4 : 1.**

d) 1 : 1.

Given curves are:
$y^2 = 2x^2$ and $y^2 = 4x$
i.e., $(y + \sqrt{2}x)(y - \sqrt{2}x) = 0$ and $y^2 = 4x$

Since, y appears only as y^2, both the graphs will be symmetric about the x-axis.
From the figure it is clear that the loops OPO and OP^{1}O are of equal areas (from symmetry about the y-axis).
∴ Ratio of their areas is 1 : 1.   Choice (D)

Q8. DIRECTIONS *for questions 8 and 9:* Type in your answer in the input box provided below the question.

If the number of diagonals of a convex polygon is 50% more than the number of its sides, find the sum of all the interior angles of the polygon (in degrees).

No of diagonals of a polygon of n sides = $^nC_2 - n$

Now, $^nC_2 - n = \dfrac{3}{2}n$

$\dfrac{n(n-1)}{2} = \dfrac{3}{2}n + n$

$n^2 - n = 5n$
$n(n - 6) = 0$
since $n \neq 0$, so $n = 6$
Sum of all the interior angles of a hexagon
$= (6 - 2)\,180° = 720°$ Ans: (720)

Q9. DIRECTIONS *for questions 8 and 9:* Type in your answer in the input box provided below the question.

A cake is cut into three pieces, whose weights are in the ratio 1 : 2 : 3. The heaviest piece is then further cut into four pieces, whose weights are in the ratio 1 : 2 : 3 : 4. If at the end of this process, the lightest piece obtained weighs 24 gm, find the weight (in gm) of the original cake.

Let the weight of the three pieces be x, $2x$ and $3x$ respectively.
Again $3x$ is cut into 4 pieces which are in the ratio $1 : 2 : 3 : 4$
Let the weights of these pieces be denoted by y, $2y$, $3y$ and $4y$ respectively.
$\therefore 10y = 3x$
It is given that $y = 24$, i.e., $3x = 10y = 240$
Weight of the original cake $= 6x = 480$ gm   Ans: (480)

Q10. DIRECTIONS *for questions 10 to 12:* Select the correct alternative from the given choices.

A and B start simultaneously from P and Q towards Q and P respectively. The speeds of A and B are 25 kmph and 32 kmph respectively. They meet at R and immediately return to their respective starting positions after exchanging their speeds. If the distance between P and Q is 2000 km, then the difference in times taken by A and B to reach their respective starting positions is

a) **15.5 hours.**

b) **20 hours.**

c) **16 hours.**

d) **17.5 hours.**
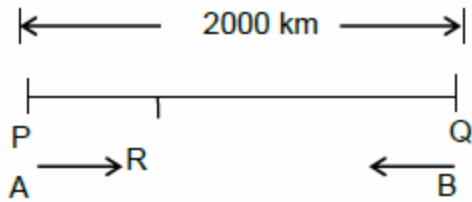
A travels from P to R with 25 kmph and at that moment B assumes the velocity of 25 kmph at R to reach Q.

$\therefore$ Time taken by B = $\dfrac{2000}{25}$ = 80 hours

Similarly time taken by A = $\dfrac{2000}{32}$ = 62.5 hours.

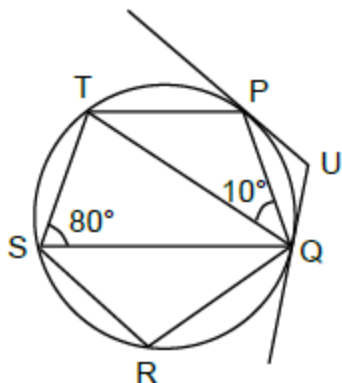$\therefore$ Difference in times taken = 80 – 62.5
= 17.5 hours

Choice (D)

Q11. DIRECTIONS *for questions 10 to 12:* Select the correct alternative from the given choices.

PQRST is a pentagon inscribed in a circle. U is a point outside the circle such that UP and UQ are tangents to the circle touching it at P and Q respectively. If $\angle$ QST = 80° and $\angle$ PQT = 10°, then find $\angle$ PUQ.

a) **30°**

b) **40°**

c) **50°**

d) **60°**

Quadrilateral PQST is cyclic

∴ ∠QPT + ∠QST = 180°

⇒ ∠QPT = 100°

In ΔPQT, ∠QPT + ∠PQT + ∠PTQ = 180°

⇒ ∠PTQ = 70°

Further, by alternate segment theorem,

∠PTQ = ∠PQU = 70°

Now, in ΔPQU, UP = UQ (tangents from the same point)

∴ ∠UPQ = ∠PQU = 70°

∴ In ΔPQU, ∠UPQ + ∠PQU + ∠PUQ = 180°

⇒ ∠PUQ = 180° – (70° + 70°) = 40°   Choice (B)

Q12. DIRECTIONS *for questions 10 to 12:* Select the correct alternative from the given choices.

Find the remainder when 4^{84} is divided by 6.

a) **0**

b) **2**

c) **3**

d) **4**

Remainder of 4^N, where N is any natural number, when divided by 6, is always 4.

Choice (D)

Q13. DIRECTIONS *for question 13:* Type in your answer in the input box provided below the question.

$f(x)$ is a polynomial of degree four such that $f(1) = 1$, $f(2) = 2$, $f(3) = 3$, and $f(4) = 4$. If $f(0) = 24$, find $f(5)$.

f(x)	1	2	3	4
x	1	2	3	4

The difference between consecutive values of $f(x)$ is a constant.

f(x)   1   2   3   4
difference   1   1   1

this would be true, if $f(x)$ is of the linear form
for eg. If $f(x) = ax + b$
$f(1) = a + b$ Difference

                      a

$f(2) = 2a + b$

                      a

$f(3) = 3a + b$

It is given that $f(x)$ is a polynomial of degree four. So $f(x)$ must be of such a form that for these values it takes a linear form
$f(x) = K(x - 1)(x - 2)(x - 3)(x - 4) + ax + b$
$f(1) = a + b = 1$
$f(2) = 2a + b = 2$
solving, we get, $a = 1$ and $b = 0$
$f(0) = K(24) = 24$
$\therefore K = 1$
$\therefore f(5) = (5 - 1)(5 - 2)(5 - 3)(5 - 4) + 5 = 29$ Ans: (29)

Q14. DIRECTIONS *for questions 14 and 15:* Select the correct alternative from the given choices.

A computer performs a certain algorithm to compute an output S for an input N, both S and N being real values. The algorithm is as follows.

Step 1: S = 0.

Step 2: If (N ≤ –1 or 1 ≤ N), then S = S + 1. Else, go to Step 5.

Step 3: N = N ÷ 10.

Step 4: Go to Step 2.

Step 5: Print S.

Which of the following statements best describes the algorithm?

a) **It calculates the highest power of 10 that can perfectly divide N.**

b) **It calculates the number of digits in N.**

c) **It calculates the number of zeros on the extreme right of N.**

d) **It calculates the number of digits to the left of the decimal point in N.**

In the algorithm S is a counter that counts the number of instances for which the value N lies outside (–1, 1) after every successive division by 10.
Suppose, after n divisions, N becomes less than 1. This means that there were n digits in the initial value of N, to the left of the decimal. (i.e., $S = n$ is the output)

Choice (D)

Q15. DIRECTIONS *for questions 14 and 15:* Select the correct alternative from the given choices.
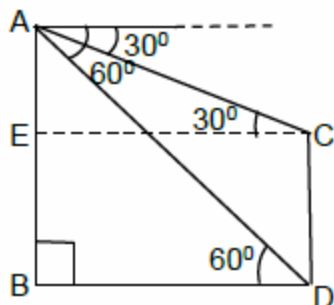
From the top of a tower, the angles of depression of the top and bottom of a building are observed to be 30° and 60° respectively. If the building is 40 m away from the tower, then what is the height of the building?

a) $40 \sqrt{30}$ m

b) $\dfrac{40}{\sqrt{3}}$ m

c) **60 m**

d) $\dfrac{80}{\sqrt{3}}$ m

Let us denote the tower and the building by AB and CD respectively.
It is given that BD = EC = 40

In △ AEC, $\tan 30° = \dfrac{AE}{EC}$

$$AE = \dfrac{40}{\sqrt{3}} \left[\because \tan 30 = \dfrac{1}{\sqrt{3}} \right]$$

In △ ABD, $\tan 60° = \dfrac{AB}{BD}$

$$\Rightarrow AB = 40\sqrt{3} \left[\because \tan 60 = \sqrt{3} \right]$$

Height of the building CD = AB − AE

$$= 40\sqrt{3} - \dfrac{40}{\sqrt{3}} = \dfrac{80}{\sqrt{3}} m$$

Choice (D)

Q16.   DIRECTIONS *for questions 16 to 19:* Type in your answer in the input box provided below the question.

The average age of a class of 59 students and their teacher is 22 years and 4 months. If the average age of the class falls by four months when the teacher is excluded, what is the age (in years) of the teacher?

Let the age of the teacher be T years.
Total age of the students = 59 × 22
Total age of the class with the teacher = 59 × 22 + T

Total age of the class with the teacher = $60 \times 22\dfrac{1}{3}$

$59 \times 22 + T = 60 \times \dfrac{67}{3}$

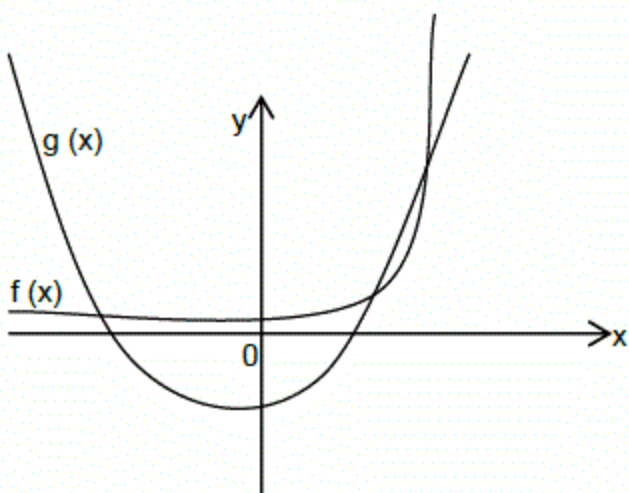∴ T = 1340 − 1298 = 42 years.

Ans: (42)

Q17. DIRECTIONS *for questions 16 to 19:* Type in your answer in the input box provided below the question.

Find the number of solutions to the equation $6x^2 + 5x - 6 - e^x = 0$.

Let $e^x = f(x)$ and $6x^2 - 5x + 6 = g(x)$

$6x^2 + 5x - 6 = 0$
$\Rightarrow (2x + 3)(3x - 2) = 0$
$\Rightarrow x = -\dfrac{3}{2}$ or $x = \dfrac{2}{3}$

Let us find the value of $f(x)$ and $g(x)$ at different values of x.

x	-2	0	1	6
f(x)	0.14	1	2.7	387
g(x)	8	-6	5	240

At $x = -2$ $f(x) < g(x)$
At $x = 0$ $f(x) > g(x)$

Therefore there is one point of intersection between $x = -2$ and $x = 0$
Similarly at $x = 1$ $f(x) < g(x)$
Therefore there is another point of intersection between $x = 0$ and $x = 1$
Similarly at $x = 6$ $f(x) > g(x)$
$\therefore$ There is a third point of intersection between $x = 1$ and $x = 6$.
Form the graph, we can conclude, there will not be any other point of intersection of $f(x)$ and $g(x)$ (since the exponential curve increased more steeply than the quadratic). Thus there are exactly three points of intersection.   Ans: (3)

Q18. DIRECTIONS *for questions 16 to 19:* Type in your answer in the input box provided below the question.

If $A = 1 + 2 + 2^2 + 2^3 + \ldots + 2^n$ and $B = 1 + 4 + 4^2 + 4^3 + \ldots + 4^m$, and $A = 3B$, find the value of $n - 2m$.

As A and B are the sum of the first n and m terms of two geometric progressions and $A = 3B$, we have

$$\frac{1(2^{n+1} - 1)}{2 - 1} = 3\left[\frac{1(4^{m+1} - 1)}{4 - 1}\right]$$

$\Rightarrow 2^{n+1} - 1 = 4^{m+1} - 1 \Rightarrow 2^{n+1} = 4^{m+1}$
$\Rightarrow n + 1 = 2m + 2 \Rightarrow n - 2m = 1$

Alternative Solution:

By observation $1 + 2 = 3 \times (1)$, i.e., $n = 1$ and $m = 0$
$\Rightarrow 1 - 2\,(0) = 1.$ Ans: (1)

Q19. DIRECTIONS *for questions 16 to 19:* Type in your answer in the input box provided below the question.

N is a three-digit number in the number system to the base 6. If the order of the digits is reversed and the number is then considered in base 11, its value becomes four times the value of the original number in base 6. How many values are possible for N.

Let the number when expressed in base 6 be represented by $(a \, b \, c)_6$
It is given that $4 \, (a \, b \, c)_6 = (c \, b \, a)_{11}$
$\Rightarrow 4 \, (36a + 6b + c) = (121c + 11b + a)$
$\Rightarrow 143a + 13b = 117c$
$\Rightarrow 11a + b = 9c$
As the number is expressed in base 6, b can be any digit from 0 to 5.
If $b = 0$, then $9c = 11a$
$\Rightarrow \dfrac{c}{a} = \dfrac{11}{9}$
This is not possible as a and c needs to be from 0 to 5.
If $b = 1$, $9c = 11a + 1$
$\Rightarrow 9c = 9a + 2a + 1$.
As L.H.S is divisible by 9, R.H.S must be divisible by 9 i.e., $2a + 1$ must be divisible by 9.
$\therefore a = 4$ and $c = 5$.
If $b = 2$, $9c = 11a + 2$
$\Rightarrow 9c = 9a + 2a + 2$
We do not get any possible value of a within the admissible range.
If $b = 3$, $9c = 9a + 2a + 3$
As $2a + 3$ is divisible by 9, we get $a = 3$ and $c = 4$.
If $b = 4$, $9c = 9a + 2a + 4$.
Again $2a + 4$ to be divisible by 9 does not given any value of a in the admissable range.
If $a = 5$, $9c = 9a + 2a + 5$
As $2a + 5$ is divisible by 9, we get $a = 2$ and $c = 3$.
Thus the numbers satisfying the given criteria in base 6 are $(415)_6$ or $(334)_6$ or $(253)_3$.
Therefore three possible values exist for N.   Ans: (3)

Q20.   DIRECTIONS *for questions 20 to 25:* Select the correct alternative from the given choices.

By selling two items, each at the same selling price, a shopkeeper made an overall profit of 20%. If one item was sold at a profit of 50%, then the other was sold at

a) **a loss of 10%.**

b) **a loss of 30%.**

c) **a profit of 10%.**

d) **no profit no loss.**

Let the selling price of each item be x
As the overall profit is 20%
$(CP_1 + CP_2) \, 1.2 = 2x$
$\therefore CP_1 + CP_2 = \dfrac{2x}{1.2} = \dfrac{5}{3}x$
As the first item was sold at 50% profit,
$1.5CP_1 = x$
$CP_1 = \dfrac{x}{1.5} = \dfrac{2}{3}x$
$\therefore CP_2 = \dfrac{5}{3}x - \dfrac{2}{3}x = x$
Thus the second item was sold at cost price, i.e. no profit no loss.   Choice (D)

Q21. DIRECTIONS *for questions 20 to 25:* Select the correct alternative from the given choices.

A task is assigned to a group of *n* men, not all of whom work at the same rate. Every day exactly two men out of the group work on the task, with no same pair of men working together twice. Even after all the possible pairs have worked once, all the men together had to work for exactly one day more to finish the task. Find the number of days that will be required for all the men working together to finish the task.

a) **2n – 1**

b) *n* – **1**

c) $n^2 - 1$

d) *n*

Since *n* people are working in all possible pairs, each person works for exactly $(n - 1)$ days.
After that each person has to work for 1 more day to complete the work.
$\therefore$ All people working together need exactly *n* days to finish the work.
                                                                                        Choice (D)

Q22. DIRECTIONS *for questions 20 to 25:* Select the correct alternative from the given choices.

Amropali, a mathematician, had a strange wish of finding out the number of ways in which she could express her mobile number '9898989898' as the difference between the squares of two natural numbers and she observed that it can be done in x ways. What was the value of x arrived at by her?

a) **0**

b) **1**

c) **3**

d) **More than 3**

Let $a^2 - b^2$ = 98 98 98 98 98 where a, b are natural numbers
$(a - b)(a + b)$ = 98 98 98 98 98.
We will get integral values of a and b only
When both $(a - b)$ and $(a + b)$ are odd OR
When both $(a - b)$ and $(a + b)$ are even.
Now, since her mobile no is even, both $(a - b)$ and $(a + b)$ cannot be odd.
Again if both $(a - b)$ and $(a + b)$ are even then her mobile no must be divisible by 4, which, again, is not true.
Hence, $x = 0$.   Choice (A)

Q23. DIRECTIONS *for questions 20 to 25:* Select the correct alternative from the given choices.

Two circles, C_1 and C_2, with respective radii of 13 cm and 17 cm and their centres 20 cm apart, intersect each other at two points P and Q. Find the area (in sq.cm) of the biggest triangle that can be drawn in the region where the two circles overlap, such that two of the vertices of the triangle are P and Q.

a) $24\sqrt{30}$

b) $8\sqrt{30}$

c) $12\sqrt{30}$

d) $6\sqrt{30}$

Let O_1 and O_2 be the centres of the circles with radii 13 cm and 17 cm.
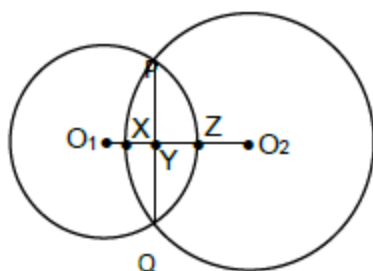
$O_1Z + O_2X - XZ = O_1O_2$

$13 + 17 - XZ = 20$

$\therefore XZ = 10$

Thus $O_1X = 3$ and $O_2Z = 7$

Let $XY = x$

$\therefore$ In ΔO_1PY

$(O_1P)^2 = (PY)^2 + (O_1Y)^2$

$13^2 = (PY)^2 + (O_1X + XY)^2$

or, $13^2 = (PY)^2 + (3 + x)^2$ ------ (1)

In ΔO_2PY

$(O_2P)^2 = (PY)^2 + (O_2Y)^2$

$17^2 = (PY)^2 + (O_2X - XY)^2$

$17^2 = (PY)^2 + (17 - x)^2$ ----- (2)

Equating the expressions for $(PY)^2$ from equation (1) and equation (2), we get

$169 - 9 - 6x - x^2 = 189 - 189 + 34x - x^2$

$40x = 160$ or, $x = 4$

Therefore $XY = 4$ and $YZ = 6$

Now $(PY)^2 = 13^2 - 7^2$ or, $PY = 2\sqrt{30}$. Thus $PQ = 2(PY) = 4\sqrt{30}$

Area of the triangle with vertices at P and Q inscribed in the overlapping region between the two circles will be maximum when the third vertex is at Z i.e., it would be an isosceles triangle.

Area of the triangle

$= \dfrac{1}{2}$ (PQ) (YZ) $= \dfrac{1}{2}$ $(4\sqrt{30})(6) = 12\sqrt{30}$ sq.cm   Choice (C)

Q24. DIRECTIONS *for questions 20 to 25:* Select the correct alternative from the given choices.

If $x + \dfrac{1}{x} = \sqrt{2} + 1$, find the value of $x^4 - 2x^3 + x^2 - 2x + 5$.

a) −1

b) $-3 + 5\sqrt{2}$

c) 4

d) **None of the above**

$$x + \frac{1}{x} = \sqrt{2} + 1$$

$x^2 + 1 = \sqrt{2}\, x + x$

Taking the square of both sides, we get

$x^4 + 2x^2 + 1 = 2x^2 + x^2 + 2\sqrt{2}\, x^2$

$x^4 - x^2 + 1 = 2x(x^2 - x + 1)\ (\because \sqrt{2}\, x = x^2 - x + 1)$

$x^4 - 2x^3 + x^2 - 2x + 1 = 0$

$\therefore x^4 - 2x^3 + x^2 - 2x + 1 + 4 = 4$

Alternative Solution:

One could solve for x from the equation $x + \frac{1}{x} = \sqrt{2} + 1$ and then use the calculator to numerically evaluate the given expression in x and arrive at an answer.

Choice (C)

Q25. DIRECTIONS *for questions 20 to 25:* Select the correct alternative from the given choices.

There are n stones, each weighing 1 kg, 2 kg, … n kg respectively. These stones are placed in three bags – A, B and C – in the following manner. Bag A contains the stones weighing 1 kg, 4 kg, 7 kg …; Bag B contain the stones weighing 2 kg, 5 kg, 8 kg….., while Bag C contains the rest of the stones.

After this, the Average Weight (AW), defined as $\dfrac{\text{Total Weight of stones in a bag}}{\text{Number of stones in that bag}}$, is calculated for each bag. It is then found that the AWs of exactly two of the three bags are same as the weight of one of the stones in the respective bags, while the AW of the other bag is different from the weight of any stone in it. Which of the following can be the value of n?

a) **82**

b) **99**

c) **90**

d) **113**

The weights are in A.P. If we take an odd number of terms of an AP, the average of all the terms is also a term of the A.P. But for an even number of terms, it is not. As two of the AWs are the equal to the weights of the stones in the two bags, those two bags should contain an odd number of stones and the other bag, an even number of stones.

A $2k+1$ | $2k-1$
B $2k+1$ | $2k-1$
C $2k$ | $2k$

$\therefore n = 6k+2$ or $6k-2$
Hence it can be 82, but not 99, 90 or 113.   Choice (A)

Q26. DIRECTIONS *for question 26:* Type in your answer in the input box provided below the question.

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

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

Q27. DIRECTIONS *for question 27:* Select the correct alternative from the given choices.

A circular track has a radius of r m. A sprinter started running on it. His average speed (in m/min) was $2\pi r$ for the first 15 seconds, πr for the next 30 seconds, $\dfrac{\pi r}{2}$ for the next 60 seconds and $\dfrac{\pi r}{4}$ for the next 120 seconds and so on. Find the ratio of the times taken by him to run the first and the second round.

a) **1 : 4**

b) **1 : 8**

c) **1 : 16**

d) **1 : 32**

> We see that successive speeds are getting multiplied by 1/2 and successive time intervals by 2. Therefore, successive distances remain constant at $\pi r/4$ m.
>
> Successive time intervals (in min) form the GP $\dfrac{1}{4}, \dfrac{1}{2},$ 1, 2,.....
>
> The time needed for the first round is the sum of the first 4 terms of this GP and the time needed for the second round is the sum of the next 4 terms.
> Each of the time intervals in the second set is 16 times the corresponding intervals in the first set.
> Therefore the total time to run the second round is 16 times the time needed for the first round. Choice (C)

Q28. DIRECTIONS *for questions 28 and 29:* Type in your answer in the input box provided below the question.

P, Q, R, S and T are five whole numbers that satisfy the three relations given below.

P + Q + R + S + T = 6

P + 2Q + 2R + 3S + T = 14

4P + 2Q + 2R + S + 4T = 11

If the least and the greatest of the five numbers are denoted by X and Y respectively, then how many of the following statements are true?

    I.   X = P = 0

    II. Y = S = 3

    III. X = P or X = T

IV. X = T or Y = RQ29.

In each of the 3 equations, the coefficient of P, T are equal and those of Q, R are equal.
∴ Effectively there are only 3 unknown.
(P + T) + (Q + R) + S = 6 ——— (1)
(P +T) + 2 (Q + R) + 3S = 14 —— (2)
4 (P + T) + 2 (Q + R) + S = 11 — (3)
(2) – (1) and (3) – 4(1) give us
(Q + R) + 2S = 8
–2 (Q + R) – 3S = – 13
∴ Q + R = 2 and S = 3 and P + T = 1
i.e., if P + T = 1, Q + R = 2, S = 3 each of the equation (1), (2) and (3) follows
We consider the option
I.   X Could be P, T, Q or R. False
II. Y is S = 3. True.
III. X may be P or T. It may also be Q or R. False.
IV. X may be T. It could also be P, Q or R. False.
Y is not R
∴ Exactly one statement is true.   Ans: (1)

DIRECTIONS *for questions 28 and 29:* Type in your answer in the input box provided below the question.

How many two-digit numbers have their square as 1 more than a multiple of 24?

The square of any natural number n leaves a remainder of 1 when divided by 24 if and only if $n = 6p \pm 1$ (since n must be divisible by neither 2 nor 3) where p is a natural number.
∴ The two-digit numbers are of the form $6p \pm 1$.
There are 15 two-digit numbers of the form $6p + 1$ and 15 two-digit numbers of the form $6p – 1$.
∴ A total of 30 two-digit numbers satisfy the given condition.   Ans: (30)

Q30. DIRECTIONS *for question 30:* The question below is followed by two statements, I and II. Study whether the information given in the statements is sufficient to answer the question and select the appropriate answer from the given choices.

If p, q, r and s are all real numbers, then is $pq > rs$?

    I. $p > r$ and $q > s$.

    II. p and q are negative numbers.

a) **The question can be answered by using statement I alone, but cannot be answered by using statement II alone.**

b) **The question can be answered by using statement II alone but not by using statement I alone.**

c) **The question can be answered by using either statement alone.**

d) **The question can be answered by using both the statements together, but cannot be answered by using either statement alone.**

Using statement I alone:
Consider the following two cases
(i) $p > 0$, $q < 0$, i.e., say $p = 3$, $q = -2$
(ii) $p < 0$, $q < 0$, i.e., say $p = -2$, $q = -1$
(i)   If $p > r$ and $q > s$, let $r = 2$ and $s = -4$
     the $pq = -6$, $rs = -8$
     $\Rightarrow pq > rs$
(ii) If $p > r$ and $q > s$, let $r = -4$ and $s = -2$
     then $pq = 2$, and $rs = 8$
$\Rightarrow pq < rs$
Hence statement I alone is not sufficient.
Using statement II alone: Both p and q are negative but we do not know anything about r and s. Hence II alone is also not sufficient.
Using both statements:
Consider $p = -2$, $r = -4$, $q = -2$, $s = -4$
Then $pq = 4$, $rs = 16 \Rightarrow pq < rs$
Even in case (ii) above $pq < rs$.
Hence using both statements we can conclude that $pq < rs$.   Choice (D)

Q31. DIRECTIONS *for question 31:* Type in your answer in the input box provided below the question.

If x_1, x_2, x_3, x_4 are four real numbers, all of the same sign, then find the minimum value of

$$\sum_{i=1}^{4}\sum_{j=1}^{4}\left(\frac{x_i}{x_j}\right).$$

x_1, x_2, x_3 and x_4 are four real numbers of the same sign.

$$\sum\sum\frac{x_i}{x_j} = \left(\frac{x_1}{x_1}+\frac{x_1}{x_2}+\frac{x_1}{x_3}+\frac{x_1}{x_4}\right)+\left(\frac{x_2}{x_3}+\frac{x_2}{x_4}+\frac{x_2}{x_1}+\frac{x_2}{x_2}\right)$$

$$+\left(\frac{x_3}{x_4}+\frac{x_3}{x_1}+\frac{x_3}{x_2}+\frac{x_3}{x_3}\right)+\left(\frac{x_4}{x_1}+\frac{x_4}{x_2}+\frac{x_4}{x_3}+\frac{x_4}{x_4}\right)$$

$$=\left(\frac{x_1}{x_2}+\frac{x_2}{x_1}\right)+\left(\frac{x_1}{x_3}+\frac{x_3}{x_1}\right)+\left(\frac{x_1}{x_4}+\frac{x_4}{x_1}\right)$$

$$+\left(\frac{x_2}{x_3}+\frac{x_3}{x_2}\right)+\left(\frac{x_2}{x_4}+\frac{x_4}{x_2}\right)+\left(\frac{x_3}{x_4}+\frac{x_4}{x_3}\right)+4$$

$\dfrac{x_i}{x_j}$ is +ve ($\because$ all the x's are of the same sign)

$\Rightarrow \dfrac{x_i}{x_j}+\dfrac{x_j}{x_i} \geq 2$ ($\because$ AM $\geq$ GM)

$\sum\sum\dfrac{x_i}{x_j} \geq 2+2+2+2+2+2+4 = 16$

The required minimum value = 16. It occurs if we take $x_1 = x_2 = x_3 = x_4$.

Ans: (16)

Q32. DIRECTIONS *for question 32:* Select the correct alternative from the given choices.

Over a period of 11 days, a vegetable vendor visited exactly ten villages for selling vegetables. On each day he visited exactly one village, but he did not revisit any village within two days of visiting it. In how many ways could he have visited the villages in the period of 11 days?

a) $10(9)^{10}$

b) $90(8)^9$

c) $10(8)^{10}$

d) $720(7)^8$

On the first day, the vendor can visit any one of the 10 villages. On the second day, the vendor can visit any one of the remaining 9 villages. On the third day, the vendor can visit any one of the remaining 8 villages.
From the fourth day onwards till the eleventh day, on each day he can visit any one of 8 of the 10 villages, i.e., excluding the villages he visited on the preceding two days. Therefore the number of ways in which the vendor can visit the villages in 11 days
= (10) (9)8⁹.   Choice (B)

Q33.   DIRECTIONS *for question 33:* Type in your answer in the input box provided below the question.

Two of the three dimensions of a cuboidal box are 9 units and 12 units. Compute the length (in units) of the third dimension of the box, such that the body diagonal of the box is the least possible integer under the given conditions.

We know that the space diagonal i.e., PQ for a cuboid is given by
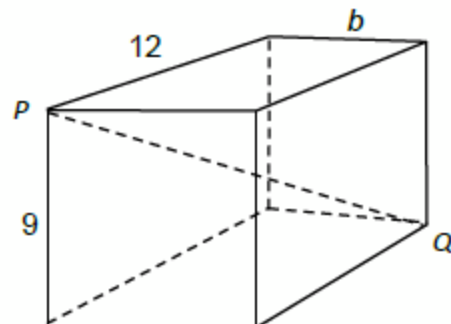
$d = \sqrt{l^2 + h^2 + b^2}$

Let the unknown dimension be '*b*'

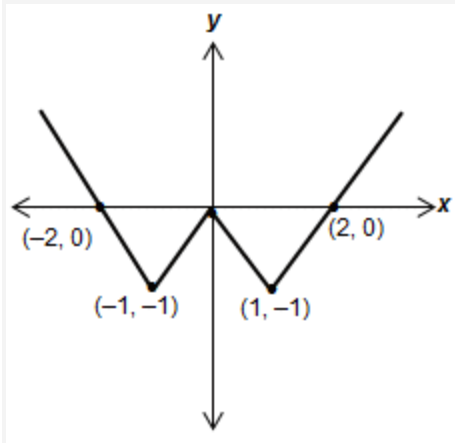$\Rightarrow d = \sqrt{12^2 + 9^2 + b^2} = \sqrt{225 + b^2}$ ------ (1)

Since we are asked to find the least '*b*' for which *d* is an integer, a simple method would be to list the squares greater than 225 (i.e.,) 256, 289, 324 - - -

Clearly at *b* = 8, *d* = 17 (= $\sqrt{289}$)   Ans: (8)

Q34. DIRECTIONS *for question 34:* Select the correct alternative from the given choices.

Which of the following functions best describes the graph given below?

a) $y = | |x| + 1| - 2$

b) $y = | |x| - 2| - 1$

c) $y = | |x| - 1| - 1$

d) $y = | |x - 1| - 1|$

By substitution, we can observe that the points (0, 0), (−2, 0), (2, 0), (−1, −1) and (1, −1) satisfy only the relation $y = | |x| - 1| - 1$ among the given options.

Choice (C)