# AIMCAT 2014
# VARC

DIRECTIONS for questions **1 to 6**: The passage given below is accompanied by a set of six questions. Choose the best answer to each question.

In Hinduism's Vedic mythos, the deity Indra battles with a dragon that swallows Indra whole. A strikingly similar tale captured in the fossil record shows a newly recognized species of lizard in a dinosaur's belly. Named Indrasaurus wangi, after the mythical encounter, the reptile was found within the abdomen of a [four-winged] dinosaur known as Microraptor [whose] fossil […] was itself unearthed from the 130-million-year-old Jehol biota, a treasure trove of Cretaceous-period fossils in what's now north-eastern China. It is the fourth Microraptor fossil to preserve stomach contents, but the first to show that Microraptors ate lizards. Previous fossils captured it eating small mammals, fish, or birds…

The Jehol biota [elucidates] what dinosaurs were eating which other dinosaurs. [T]he specimen is helping improve reconstructions of the ancient Jehol food web [by the] lead study author Jingmai O'Connor, a palaeontologist at China's Institute of Vertebrate Palaeontology and Palaeoanthropology (IVPP), and her colleagues...At least six types of plants form the base of the food chains in this tangled web. Lizards and dinosaurs alike fed on the lake ecosystem's abundant fish, and small mammals played the part of both predator and prey. Sinocalliopteryx, an eight-foot-long carnivore, seems to have been an apex predator, while Microraptor sat in the middle, picking off whatever it could.

…Once the team noticed the lizard [in the Microraptor fossil], they identified it because its bones are so well-preserved. And this exceptional preservation raises questions about how dinosaurs—including birds—evolved to digest their food. To power flight, modern birds have evolved an extremely efficient, specialized digestive system. Instead of chewing their food with teeth, they swallow it whole down an enlarged oesophagus, which in many birds forms a kind of pouch called the crop. The food then makes its way through a gauntlet of two stomachs. The

first secretes digestive enzymes that chemically break down the food. The second, a thunder-dome of muscle called the gizzard, grinds up the food with the help of small stones. Some predatory birds such as owls take an additional step and spit back up pellets of undigested bone, feathers, and hair. This behaviour appears to go way back: the feathered dinosaur Anchiornis, an ancient cousin of modern birds, seems to have also spat up pellets of bone, based on analysis of six 160-million-year-old fossils.

Some palaeontologists had interpreted the Anchiornis evidence as a sign that forming gastric pellets was a necessary adaptation on the road to avian flight. By spitting up bone and feathers, the thinking goes, some flying birds wouldn't have to lug around unnecessary weight. But Microraptor's flight-ready feathers suggest that it could fly under its own power—and judging by the more intact state of Indrasaurus and other Microraptor meals, not all flying dinosaurs vomited up pellets. Of the four Microraptor specimens that have fossilized stomach contents, all four prey items appear to be whole, not jumbled-up bits of bone.

… O'Connor suspects that the Microraptor kept its meals in its stomach for longer than Anchiornis and modern birds, ultimately passing bone in their faeces like other dinosaurs such as Tyrannosaurus rex. This difference may be surprising, given how closely Microraptor and Anchiornis are thought to be related. Perhaps the Anchiornis pellets suggest that its lineage lies closer to the ancestors of modern birds than the dromaeosaurs, the dinosaur group to which Microraptors belong.

But as O'Connor points out, it's also possible that pellets simply evolved more than once. After all, hacking up indigestible bits of food is hardly unique to birds; living creatures from crocodiles to sperm whales do it, too. Like other traits, such as feathers, perhaps birds' presently unique digestive tract wasn't so evolutionarily unique, after all… "You can't point to one change, one thing that evolved, and say that's what contributed to [birds'] success," O'Connor says. The ancestors of modern birds "survived the end-Cretaceous extinction probably because they were the only lineage that had all these adaptations that had evolved numerous times ... they were the ones that had them all together in one package."

Q1.   The 'surprising' difference between the Microraptor and Anchiornis mentioned in the passage least strengthens which of the following arguments?

 a) Microraptors and Anchiornis are not as closely related as they were previously thought to be.
 b) The lineage of Anchiornis lies closer to the ancestors of modern birds than that of Microraptors does.
 c) The lineages of Microraptors and Anchiornis could be different.
 d) The Microraptors kept their meals in their stomachs for longer than Anchiornis and modern birds.

Consider the sentences: 'O'Connor suspects that the Microraptor kept its meals in its stomach for longer than Anchiornis and modern birds, ultimately passing bone in their faeces like other dinosaurs such as Tyrannosaurus rex. This difference may be surprising, given how closely Microraptor and Anchiornis are thought to be related. Perhaps the Anchiornis pellets suggest that its lineage lies closer to the ancestors of modern birds than the dromaeosaurs, the dinosaur group to which Microraptors belong.' The 'surprising difference' is that the Microraptor probably passed bone in its faeces, whereas the Anchiornis passed pellets as spit.

Option A:  The difference is surprising to the author, *given how closely Microraptor and Anchiornis __are thought to be related__*. So, the difference, will possibly indicate that they are not as closely related as thought to be, thus supporting the option. Hence, Option A is not the answer.

Option B: Given that the Anchiornis spit up pellets like some of the modern birds, the difference (that Anchiornis spit up pellets while Microraptors don't, instead passit on in their faeces) does strengthen this argument that Anchiornis is closer to modern birds than Microraptors are. Hence, Option B is not the answer.

Option C: The surprising difference changes the known view that microraptors and Anchiornis are related. Because of the difference it may be argued that the lineages of the two species are different. Therefore, Option C is not the answer.

Option D: It is the information in this choice that leads us to the speculation that Microraptors functioned differently from Anchiornis. That led to the surprising difference in how they shed the indigestible content in their food. So, the surprising difference cannot strengthen this choice (circular argument – If A was used to arrive at B, obviously B cannot strengthen A) as the difference was arrived at using the conjecture in this choice. Option D is the answer.                                Choice (D)

Q2.   The 'more intact state of the Indrasaurus' inside the Microraptor fossil helped the palaeontologists infer that

 a) the digestive tract of Microraptors is similar to that of the Tyrannosaurus Rex.
 b) Microraptors had flight-ready feathers which ensured they didn't have to spit up bone and feathers to power their flight.
 c) flying dinosaurs and modern birds do not share the same lineage.
 d) spitting up pellets wasn't the only way undigested bone was gotten rid of by flying dinosaurs.

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

Number of words: 670

The inference drawn by palaeontologists can be understood from '...and *judging by the more intact state of Indrasaurus and other Microraptor meals, not all flying dinosaurs vomited up pellets.* Of the four Microraptor specimens that have fossilized stomach contents, all four prey items appear to be whole, not jumbled-up bits of bone'.

Option A: Consider the sentences: '*O'Connor suspects that the Microraptor kept its meals in its stomach for longer than Anchiornis and modern birds, ultimately passing bone in their faeces like other dinosaurs such as Tyrannosaurus rex.*' While O'Connor suspects that the microraptors could be similar to the Rex in the way bone is passed in the faeces, it cannot be inferred that the digestive tract of Microraptors is entirely the same as that of the Rex. Hence, Option A is not the answer.

Option B: The fact that they had flight-ready feathers counters the argument that Microraptors didn't need to spit up undigested bone to lower their weight in order to fly. It doesn't go the other way around. So, from the fact that the meals are whole in their abdomen doesn't prove the reverse, that they have flight-ready feathers. Option B is not the answer.

Option C: From the intact state of Indrasaurus, we can infer, the author says, that not all flying dinosaurs spit up pellets. From this piece of information, the author moves on to imply that Anchiornis is more related to modern birds than Microraptors. However, nowhere has it been discussed that this completely disconnects the lineage of birds from that of Microraptors. Such an inference cannot be made. Option C is not the answer.

Option D: This can be inferred from the intact Indrasaurus as stated in the underlined portion above. The intact state shows that they were in the stomach of Microraptors longer and that they were eventually passed on in the faeces rather than being spitted out. So, the intact state led the palaeontologists to speculate that there are multiple ways in which undigested bone is shed by flying dinosaurs. Option D is the answer.

Choice (D)

Q3.  O'Connor's suggestion in the last para that 'it's also possible that pellets simply evolved more than once' implies which of the following statements?

a) The Anchiornis is more closely related to the modern birds than the Microraptors.
b) The digestive tract of birds is not evolutionarily unique.
c) The ancestors of modern birds were close in lineage to that of the dromaeosaurs.
d) The Microraptor kept its meals in its stomach for longer than modern birds do.

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

Number of words:    670

Consider the sentences: 'Perhaps the Anchiornis pellets suggest that its lineage lies closer to the ancestors of modern birds than the dromaeosaurs, the dinosaur group to which Microraptors belong...**But as O'Connor points out, it's also possible that** pellets simply evolved more than once. After all, hacking up indigestible bits of food is hardly unique to birds; living creatures from crocodiles to sperm whales do it, too. Like other traits, such as feathers, perhaps birds' presently unique digestive tract wasn't so evolutionarily unique, after all...'

Option A: So, basically, there are two possibilities: Either (*Anchiornis is closer to modern birds than Microraptors*) OR (*pellets simply evolved more than once, in which case, we can understand that the digestive tract of birds is not evolutionarily unique*). The first possibility is not compatible with the second. Option A talks about the first possibility, whereas the suggestion referred to in the question is the second option which cannot imply this choice. Hence, Option A is not the answer.

Option B: The last para explains that if we consider the possibility that the pellets evolved more than once (and not just once in case the older Anchiornis is closer to modern birds than Microraptors), it is also possible that the digestive tract is not unique in birds (the multiple evolutions show that other species may also have similar digestive tracts – that's what evolving multiple times means). Option B can be implied and is the answer.

Option C: This option suggests that Microraptors and modern birds had a close lineage. Dromaeosaurs is the dinosaur group to which Microraptors belong. However, from neither of the two possibilities discussed in the passage (that Anchiornis and modern birds are related more that Microraptors and birds are related OR that pellets evolved more than once) can we infer that Microraptors were closely related to modern birds (that information has not been derived as an inference in the passage – it has just been mentioned directly). Hence, Option C cannot be implied and hence, not the answer.

Option D: The Microraptor kept its meals in its stomach for longer than modern birds do. So, it is suspected that they probably pass off undigested bone (or pellets) in their faeces, which is the first of the two possibilities discussed. So, Option D which leads to the first argument cannot be implied from the second argument (that pellets may have evolved twice). So, Option D is not the answer.                    Choice (B)

Q4.   Which of the following, if proven to be true, weakens the inferences drawn by palaeontologists about the Jehol food web?

 a) Lizards and small mammals sat in the middle of the food web.
 b) There is no evidence of the Sinocalliopteryx being eaten by any other dinosaur species.
 c) There is no evidence of the Microraptor being preyed upon by other dinosaurs.
 d) Previous fossils of the Microraptor captured it eating plants.

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

Number of words:  670

Consider the para: '*The Jehol biota [elucidates]* **what dinosaurs were eating which other dinosaurs**. *[T]he specimen is helping improve reconstructions of the ancient Jehol food web [by the] lead study author Jingmai O'Connor, a palaeontologist at China's Institute of Vertebrate Palaeontology and Palaeoanthropology (IVPP), and her colleagues...At least six types of* **plants form the base of the food chains** *in this tangled web.* **Lizards and dinosaurs alike fed on the lake ecosystem's abundant fish**, *and small* **mammals played the part of both predator and prey**. *Sinocalliopteryx, an eight-foot-long carnivore, seems to have been an apex predator, while* **Microraptor sat in the middle, picking off whatever it could**.'

Option A: Small mammals played the part of both predator and prey. If it is true that lizards are in the middle of the food web: preying on some, preyed upon by some, it will strengthen the inferences of the palaeontologists and not weaken it further. Hence, Option A is not the answer.

Option B: This corroborates the main argument of the passage that the Sinocalliopteryx is the apex predator (doesn't get killed by any other link in the web). Option B is not the answer.

Option C: If this is true, then we can't infer that the Microraptor is in the middle of the web. In order to be in the middle of the web, there must be at least one species that preys on the Microraptor. Hence, Option C is the answer.

Option D: Even if this were true, it proves there are other links below the Microraptor in the food web, which we are already aware of because microraptors have been proven to feed on mammals and fish. Hence, Option D is not the answer.         Choice (C)


Q5.   The Anchiornis spitting up pellets of bone led some palaeontologists to infer that

a) spitting up pellets was one of the adaptations that eventually led to modern-day flying birds.
b) birds cannot fly if they carry the unnecessary weight of undigested bone and feathers.
c) the Anchiornis existed about 160-million years ago.
d) the Anchiornis was an ancient cousin of modern predatory birds

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

Number of words:    670

Option A: This can be understood directly from the sentence: '*Some palaeontologists had interpreted the Anchiornis evidence as a sign that **forming gastric pellets was a necessary adaptation on the road to avian (related to birds) flight**.*' Hence, Option A is the answer.

Option B: Anchiornis spitting up pellets according to the author has been mentioned '***as a sign that forming gastric pellets was a necessary adaptation on the road to avian flight***'. So, it was one of the steps in the evolution process which ultimately led to flying. However, is this an inference on birds directly (the end point of that evolution process)? No. Hence, Option B is not the answer.

Option C: While the passage directly mentions that the Anchiornis fossils were 160-million years old, we are not told how that inference was arrived at. There is most definitely no connection that has been made between the Anchiornis pellets and the age of the fossils. Hence, Option C is not the answer.

Option D: There is a cause-effect misinterpretation in this option. Observe the sentences: '*This behaviour appears to go way back: the feathered dinosaur **Anchiornis, an ancient cousin of modern birds**, seems to have also spat up pellets of bone, based on analysis of six 160-million-year-old fossils...Some palaeontologists had interpreted the Anchiornis evidence as a sign that forming gastric pellets was a necessary adaptation on the road to avian flight.*' The inference that Anchiornis was an ancient cousin of modern birds wasn't made from the Anchiornis spitting pellets. It was already established (the passage doesn't explain how it was known and directly introduces Anchiornis as an ancient cousin). Using the information that Anchiornis is an ancient cousin, and the evidence that the Anchiornis spits pellets, the inference was made that spitting pellets had something to do with the road to adaptations that led to modern-day birds. Hence, Option D is not the answer.                    Choice (A)

Q6.   Which of the following studies could be carried out to further enhance the depth of the given passage?

 a) A study to explore whether birds and dinosaurs have a close lineage.
 b) A study to explore whether modern predatory birds pass bone in their faeces.
 c) A study to explore whether the similarities between Microraptors and Anchiornis outweigh the differences.
 d) A study to explore whether the Anchiornis had avian abilities like flying.

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

Number of words:    670

The passage leaves one uncertainty. There are two possibilities discussed and a conclusion was not arrived at. It is not known whether the pellets evolved more than once and the birds' digestive tract is not unique (one of the possibilities), OR that Anchiornis was more closely related to birds than Microraptors (other possibility).

Option A: This is already known since the passage mentions that the Anchiornis, a feathered dinosaur, is an ancient cousin of modern birds. Hence, Option A is not the answer.

Option B: If this is true, then the second possibility mentioned above can be disproven, and it can be said that some birds are similar to Anchiornis and some to Microraptors, which will lead us to the inference that pellets are shed by birds in multiple ways, evolving in two different ways (pellets can be spit up, or undigested bones can be passed on in faeces). One way or the other this study will be more helpful to establish ancestry of birds. Option B is the answer.

Option C: The passage doesn't discuss the significance of similarities and differences between Anchiornis and Microraptors. Even if we arrive at whether the similarities outweigh the difference or vice-versa, there is no practical application of it as discussed in the passage, as there is no question hinging on this. Hence, Option C is not the answer.

Option D: Since, the passage doesn't mention whether the Anchiornis had avian abilities like flying, this will be an interesting study. However, since it is already established that it is an ancient cousin of  birds, and it is already known that some birds do spit pellets to lower their weight for flight, proving that Anchiornis had avian abilities won't enhance the scope of the arguments presented in the passage in any way. Hence, Option D is close but not the answer.                    Choice (B)

DIRECTIONS for questions **7 to 9**: The passage given below is accompanied by a set of three questions. Choose the best answer to each question.

Edgar Degas did not want to be known as a sculptor. The French artist spent his career producing impressionistic paintings and realistic drawings of dancers. But in his free time, he worked out the intricacies of the human figure and musculature of horses by creating sculptures out of beeswax, clay and plaster. During his lifetime, he only displayed one of these figures, "The Little Fourteen-Year-Old Dancer," in 1881. The rest he considered ephemeral pieces and let them degrade in his studio. On his death in 1917, over 150 of these sculptures were discovered, and are now considered masterpieces of the form.

The BBC reports that the Fitzwilliam Museum in Cambridge recently X-rayed the three fragile Degas sculptures they own, finding that the artist bulked out the armatures of his little dancers with bits of detritus he found around his studio. "The use of ordinary shop-bought armatures, wine bottle cork and old floorboards, confirm Degas to have been a highly unorthodox sculptor who used unconventional working practices, in terms of materials and technique, which resulted in the frequent loss of his wax sculpture," a spokesperson for the museum tells the BBC.

… [S]imilar examinations of the sculptures held by the National Gallery of Art in Washington, D.C., found that Degas used pieces of paint brushes and part of a saltshaker to create the sculptures. "You buy a wire armature, use these as an internal skeleton, pose the model, put clay over it and make a little figure," [says] Victoria Avery, keeper of applied arts at the Fitzwilliam... "But he snips off bits, bends them, and bulks it out probably to save money on modelling materials."

The Press Association reports that Degas' original sculptures are so fragile that they are rarely put on display. Most art lovers know his heirs commissioned Hébrard Foundry to cast 73 of his sculptures from bronze casts after his death in 1917, as it was something the painter resisted during his life (a 74th sculpture was cast later). "He'd be turning in his grave over the bronzes. He was an impressionist; he was about fleeting moments," Avery adds…

Q7.   The author mentions the BBC report about X-raying the three fragile Degas sculptures to probably highlight that

 a) Degas saved money on modelling materials.
 b) the sculptures were bulked out from detritus found around the studio.
 c) Degas abandoned orthodox methods completely in the process of making sculptures
 d) wax sculptures were frequently lost because of Degas' unconventional practices.

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

Number of words: 351

This can be understood from the following sentences: *'The BBC reports that the Fitzwilliam Museum in Cambridge recently X-rayed the three fragile Degas sculptures they own, finding that the artist bulked out the armatures of his little dancers with bits of detritus he found around his studio. "The use of ordinary shop-bought armatures, wine bottle cork and old floorboards, **confirm Degas to have been a highly unorthodox sculptor who used unconventional working practices, in terms of materials and technique, which resulted in the frequent loss of his wax sculpture**," a spokesperson for the museum tells the BBC.'*

Option A: While one of the speculations is that Degas used detritus lying around his studio to save on money, the author wouldn't go to the extent of mentioning the BBC report just to talk about Degas saving money on modelling. While that is part of the discussion, the main reason for talking about the report is to arrive at how Degas was unconventional. So, Option A is not the answer.

Option B: This was found out when the sculptures were X-rayed. The author didn't mention the BBC report about the X-rays just to talk about what was found in those X-rays. Rather, it was probably to prove a bigger point (that he was unconventional). Option B is not the answer.

Option C: Degas was unconventional and unorthodox. But the author couldn't be using this example to prove he 'completely abandoned orthodoxies' while making the sculptures. There is a gaping difference between being unorthodox and banishing all conventions. The author wanted to show Degas was unorthodox – not that Degas banished all conventions. Hence, Option C is not the answer.

Option D: This has been mentioned as the conclusion of the findings. The use of detritus and unconventional materials led to the frequent loss of sculptures. This explanation of the loss of Degas' will further help us understand why students of Degas wanted to cast his sculptures. It also explains why museums don't display Degas artifices – they are too fragile. Hence, Option D is the answer.

Choice (D)

Q8. Avery thought Degas would 'turn in his grave' because

a) he wanted to be known more as a painter than as a sculptor.
b) bronze casts would go against his belief in the ephemeral nature of things.
c) casting his sculptures in bronze is something he couldn't accomplish in his lifetime.
d) bronze casts would defeat the purpose of his letting the sculptures degrade in his studio.

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

Number of words:    351

'Turning in the grave' is an idiomatic expression used when something that would displease a deceased person is being done. So, we can infer here that Degas would be unhappy with whatever is being done – casting of his sculptures in bronze by his students, something he had resisted doing for a long time. Consider the sentences: *'Most art lovers know his heirs commissioned Hébrard Foundry to cast 73 of his sculptures from bronze casts after his death in 1917, as it was something the painter resisted during his life (a 74th sculpture was cast later). "He'd be turning in his grave over the bronzes.* **He was an impressionist; he was about fleeting moments***,"* *Avery adds.'*

Option A: While this is generally true, there is no connection between this desire of Degas and the lines where Degas turning in his grave are mentioned. That was mentioned in connection to Degas' students making bronze casts to preserve his sculptures. Option A is not the answer.

Option B: Degas would turn in his grave because he was an impressionist who believed in fleeting (ephemeral) moments. Hence, the sense of permanence/longevity that the bronze cast would bring to his sculpture would displease him. Hence, Option B is the answer.

Option C: It is not that he 'couldn't accomplish it'. He was uninterested and rather resisted doing it during his life. Hence, Option C is not the answer.

Option D: Degas wasn't quite keen about lending permanence to his sculptures. Therefore, he let them degrade in his studio, happier about being known as a painter rather than as a sculptor. There was no other purpose that Avery highlights besides that for Degas letting those sculptures go to waste. So, casting them in bronze wouldn't really impede any purpose. Hence, Option D is not the answer.

Choice (B)

Q9.   It can be most reasonably inferred from the passage that

 a) "The Little Fourteen-Year-Old Dancer" was the most impressionistic of Degas' sculptures.
 b) "The Little Fourteen-Year-Old Dancer" was Degas' favourite sculpture.
 c) sculptures made in beeswax, clay or plaster can be cast in bronze for longevity.
 d) Degas didn't want his sculptures to be put on display.

Option A: In the passage it has been mentioned that as an impressionist, Degas believed in fleeting moments. So, we can infer that impressionism is more about the temporary nature of things. Consider the sentences: *'During his lifetime, he only displayed one of these figures, "The Little Fourteen-Year-Old Dancer," in 1881. **The rest he considered ephemeral pieces and let them degrade in his studio**.'* If anything, the mentioned work is the only one Degas didn't consider ephemeral. So, it cannot be inferred that it was the most impressionistic of Degas' sculptures. Option A is not the answer.

Option B: Whether Degas liked the sculpture or not cannot be understood from the data provided. Hence, Option B is not the answer.

Option C: That Degas made them with these materials and the students wanted to cast them (while he didn't) proves that this is possible, however else others make sculptures. We are not sure if this is the only method or if there are other methods. However, we can infer that sculptures made in clay or plaster can be bronze-casted for longevity. Option C is the answer.

Option D: Degas did put one of his sculptures on display. Also, Degas' reason for not putting the others on display is their ephemeral nature. These two statements put together do not lead to the inference that Degas didn't want to put any of his sculptures on display. Option D is not the answer.                                 Choice (C)

DIRECTIONS for questions **10 to 15**: The passage given below is accompanied by a set of six questions. Choose the best answer to each question.

As a planetary body forms, precious metals such as gold and iridium are stripped from its rocky mantle and passed into its metallic core. Successive impacts with other objects then re-enrich the mantle in these elements — a process known as late accretion. Measurements of lunar rocks show that the Moon is greatly depleted in precious metals compared with Earth. This deficit implies that the ratio of mass added to Earth during late accretion compared with that added to the Moon is more than 1,000 : 1, which is substantially different from the predicted ratio of about 20 : 1. In a paper [by] Zhu et al., it is shown that inefficient delivery of material from glancing impacts, combined with an early hot, molten stage on the Moon, can explain this anomalous input-mass ratio.

An analysis of the mass and composition of material added to a planetary body can be used to examine the body's formation... The low abundances of precious metals in lunar rocks has prompted the proposal of competing models to explain the anomalous input-mass ratio between Earth and the Moon…At one extreme, these models include delivery of material by a few massive impactors (larger than 2,500 kilometres in diameter) that preferentially struck Earth. At the other, focusing of small objects (less than 10 m in diameter) on to Earth might have produced similar effects. It has also been suggested that the difference in precious-metal abundances between Earth and the Moon was caused by a drop in the flux of impacts during the period between 4.5 billion and 4.1 billion years ago, just after the Solar System formed.

These models generally assume that the Moon retained about half of the mass that was transferred to it by impactors.

Using millions of computational impact simulations, Zhu and colleagues examined the fraction of impactor mass that could be retained by planetary bodies. The authors simulated impacts at different velocities (10–20 km per second), and at low angles (20°) to high angles (80°) with respect to the body's surface. They found that material from larger impactors is less effectively retained than that from smaller counterparts, and that high-angle impacts deliver a larger mass fraction to the body than do low-angle impacts.

In the case of Earth, these results imply that the retention of impactor mass is generally high for all but the most glancing impacts with the most massive objects. For the Moon, which has a mass only about 1% of that of Earth, the shallower the angle of impact, and the more massive the impactor, the greater the likelihood that material would be lost... Using crater diameters to establish the frequency and size of impactors striking the Moon, Zhu et al. discovered that impactor-mass retention probably changed modestly over time, and that the average retention was about 20%, which is around three times lower than previous estimates.

Inefficient retention of material from objects striking the Moon partially offsets the difference between the theoretically and geochemically determined Earth–Moon input-mass ratios. Zhu and colleagues then argue that about 50% of late-accretion input mass was lost to the Moon's deep interior or core before 4.35 billion years ago, and that this loss explains any remaining discrepancy. Later, once the Moon had cooled, late-accretion input mass was distributed into the lunar mantle and crust...

The suggestion of inefficient mass retention from glancing impacts negates the requirement for the proposed temporally varying impact fluxes. [However], Zhu et al. assume that the penetration of impactors through the lunar crust, which is about 40 km thick, would lead to all retained impactor material entering the mantle. But, in reality, this material would pollute both the crust and the mantle. Finally, because only a relatively small number of lunar rocks have been analysed, models such as the authors' that can reproduce precious-metal abundances in the Moon through simulations have limited resolution.

Q10.   All the following have been mentioned as reasons behind the anomalous input-mass ratio of the moon EXCEPT:

 a) the size of the moon is only about 1% of that of the earth.
 b) moon has been struck by objects at shallower angles.
 c) moon has been struck by larger impactors.
 d) moon was in a hot molten stage at some point when struck by impactors.

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

Number of words: 638

Option A: The only point where the mass of the moon has been mentioned is in the statement 'For the Moon, **which has a mass only about 1% of that of Earth**, the shallower the angle of impact, and the more massive the impactor, the greater the likelihood that material would be lost'. So, the author indirectly refers to the influence of mass of moon and earth. However, there is no mention anywhere of the size of the moon impacting the late accretion/impact retention mass. Hence, Option A is the answer.

Option B: From '**the shallower the angle of impact**, and the more massive the impactor, the greater the likelihood that material would be lost', we can understand that if the moon is struck by the impactors at shallower angles (mentioned as low angles of about 20 degrees), the retention of mass from impact will be lower. Option B is not the answer.

Option C: Larger the size of the impactors, lower is the retention of mass in the moon, as mentioned in the passage. Hence, Option C is not the answer.

Option D: From 'In a paper [by] Zhu et al. it is shown that inefficient delivery of material from glancing impacts, **combined with an early hot, molten stage on the Moon**, can explain this anomalous input-mass ratio' AND 'Zhu and colleagues then argue that about 50% of late-accretion input mass was lost to the Moon's deep interior or core before 4.35 billion years ago, **and that this loss explains any remaining discrepancy. Later, once the Moon had cooled**, late-accretion input mass was distributed into the lunar mantle and crust...' we can understand that the moon being in a hot molten state is partially responsible for the low late accretion mass.

Choice (A)

Q11. Which of the following statements, if true, most weakens any of the author's concerns against the research results of Zhu et al.?

a) Temporally varying impact fluxes are extremely important to get an accurate picture of the late accretion mass.

b) The size of lunar rocks analysed in the studies more or less represents the average size of rocks that bombard the lunar surface.

c) The lunar crust samples have a negligible percentage of precious metals from impactors which bombarded the surface.

d) Rocks recovered from the lunar crust have the same percentage of late accretion mass as the expected percentage in the mantle of the moon.

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

Number of words:    638

We are looking for an option that weakens the author's (of the passage) concerns about the studies conducted by Zhu et al. Now, that would mean, we are looking for an option that equates to supporting the studies published or countering the author's (of the passage) reservations against the veracity of the studies.

Option A: The author clearly mentions that this is not an important factor at all, if procedure as discussed in the passage has been carried out (*The suggestion of inefficient mass retention from glancing impacts* **negates the requirement for the proposed temporally varying impact fluxes**). In other words, the tone of the author is positive here, in support of the studies. Hence, Option A doesn't **weaken the author's concerns about the studies**.

Option B: The author's concern was about the size of the sample, AND NOT the size of the lunar rocks that were used for the sample. Hence, this statement, even if true doesn't weaken the author's concerns about the studies. Option B is not the answer.

Option C: This option contradicts the concern raised by the author of the passage, that while the authors of the studies assumed that the mass will enter the mantle (because of the thin crust), some of it might be left out in the crust itself. Consider this: *'[However], Zhu et al. assume that the penetration of impactors through the lunar crust, which is about 40 km thick, would lead to all retained impactor material entering the mantle. But, in reality,* **this material would pollute both the crust** *and the mantle.'* Therefore, Option C weakens the author's (of the passage) concern. Option C is the answer.

Option D: This option strengthens the author's concern because if this statement is true, then the authors of the studies are wrong in assuming that all retained impactor material entered the mantle. Option D is not the answer.                     Choice (C)

Q12.  Which of the following is the most reasonable inference from the data presented in the passage?

 a) Earth's crust is thicker than the lunar crust.
 b) Successive impacts by other rocks are not the only source for re-enriching a planetary body with precious metals.
 c) The percentage of small impactors, of size less than 10 m in diameter, that struck the earth's surface is greater than that of small impactors which struck the lunar surface.
 d) The greater mass of the earth as compared to that of the moon increases the probability of the retention of impactor mass in case of earth.

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

Number of words:    638

Option A: While it is mentioned that the lunar crust is just 40km and the authors of the studies assumes that most of the late accretion mass settles in the mantle and not in the crust, the size of the earth's crust or the penetration levels have not been discussed in the passage. Hence, nothing can be inferred about them. Option A is not the answer.
Option B: Consider the sentences: '*As a planetary body forms, precious metals such as gold and iridium are stripped from its rocky mantle and passed into its metallic core. Successive impacts with other objects then re-enrich the mantle in these elements — a process known as late accretion.*' These lines (or the rest of the passage) do not indicate whether there are other sources or the objects striking the planetary body are the only sources of precious metals. So, we cannot really make an inference on the sources of inference metals except the one we are aware of – the impactors (rocks). Hence, Option B is not the answer.
Option C: While retention is high in case of earth compared to moon, we have not been given any data about the numbers of large and small objects that struck earth and moon. Hence, we can infer nothing about the percentages. It is quite possible a greater number of bigger objects struck earth – leaving the same amount of late accretion mass. Option C is not the answer.
Option D: Consider the sentences: '*In the case of Earth, these results imply that the* **retention of impactor mass is generally high for all but the most glancing impacts** *with the most massive objects.* **For the Moon, which has a mass only about 1% of that of Earth**, *the shallower the angle of impact, and the more massive the impactor, the greater the likelihood that material would be lost.*' So, while the author doesn't explain in the passage how the mass of the planetary body affects the late accretion mass, the author does indicate that for earth most impactor objects will leave some mass but for moon a lot of material will be lost. This is particularly understood from '**all but the most glancing impacts**' – except for the most extreme impacts with the biggest objects, retention is high for the earth. But for moon, retention keeps getting lowered with angle and size of the impactor object. Option D is the answer.
                                                                                     Choice (D)

Q13.   Which of the following is not an assumption made by Zhu et al. while examining the fraction of impactor mass that could be retained by planetary bodies?

 a) Velocities can be varied to simulate the impact of varying sizes and masses of impactors.
 b) The lunar mantle didn't have any precious metals prior to the impact.
 c) It is the thickness of the crust and not the density which affects the impact-mass retained in the mantle.
 d) The moon was in a hot molten stage only until 4.35 billion years ago.

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

Number of words:  638

Option A: Consider the sentences: '*Using millions of computational impact simulations, Zhu and colleagues examined the fraction of impactor mass that could be retained by planetary bodies. **The authors simulated impacts at different velocities** (10–20 km per second), and at **low angles (20°) to high angles (80°)** with respect to the body's surface. **They found that material from larger impactors** is less effectively retained than that from smaller counterparts, and **that high-angle impacts deliver a larger mass fraction** to the body than do low-angle impacts.*' There were only two input parameters in the simulations and two discussed in the results. The angles were discussed and the masses of the impactors (large or small). So, in the simulation velocities were mentioned. Which means the assumption is that velocity can be used to simulate magnitude of the impact (large impactor, heavy impactor, etc.). Option A is not the answer.

Option B: This was not a consideration anywhere in their simulation. While the methods were not discussed as to how the authors of the studies, Zhu et al. found out the impact retention mass, the arguments don't show that they assumed there was nothing already present there. Hence, Option B is not an assumption and hence, the answer.

Option C: This can be understood from '*Zhu et al. assume that the **penetration of impactors through the lunar crust, which is about 40 km thick**, would lead to all retained impactor material entering the mantle*'. So, the authors of the studies assumed that because the crust is 40km, the entire material would go to the mantle (the expression 'entering the mantle' suggests that it is the next layer to the crust). So, the assumption is that the crust thickness is the only parameter. It is quite likely that the crust is extremely dense and wouldn't let the impactor penetrate to the mantle. However, that has not been considered. So, the assumption is that the density doesn't matter. Option C is not the answer.

Option D: Consider this: '*Zhu and colleagues then argue that about **50% of late-accretion input mass was lost to the Moon's deep interior or core before 4.35 billion years ago**, and that this loss explains any remaining discrepancy. Later, **once the Moon had cooled**, late-accretion input mass was distributed into the lunar mantle and crust...*'

Also consider '*In a paper [by] Zhu et al., it is shown that inefficient delivery of material from glancing impacts, **combined with an early hot, molten stage on the Moon**, can explain this anomalous input-mass ratio.*' From these two, it can be understood that Zhu et al pegged the time of cooling down or solidifying to 4.35 billion years. Hence, Option D is not the answer.                                                                Choice (B)

Q14.   An answer to which of the following questions could further deepen the scope of the studies presented by Zhu et al.?

 a) Are there any other elements on the lunar surface apart from precious metals?
 b) Is the composition of the lunar crust the same as that of the earth's crust?
 c) Are the sizes of the impactors which hit the earth and the moon comparable?
 d) What is the difference in composition of lunar rocks found in the mantle and in the crust?

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

Number of words:    638

Option A: Since, the studies were predominantly driven/motivated by the lower percentage of precious metals in lunar rocks, knowing about other metals wouldn't really deepen the scope of the studies by Zhu et al. Hence, Option A is not the answer.
Option B: Since, retention mass has been predicted based on the size, frequency and angle of impact, but the composition has not been made part of the calculation, it is hard to understand how/why composition of the crust may add any value to the studies. Hence, Option B is not the answer.
Option C: The retention is calculated based on parameters of the impact (angle of impact and how large the impactor was) and the results about retention were arrived at based on calculated estimates of impactor frequency and magnitude. The difference between earth and moon in terms of mass has also been taken into consideration. Therefore, the studies don't need to further compare the sizes of the impactors, as it has already been accounted for. Option C is not the answer.
Option D: The composition of lunar rocks from the crust could give information about whether the assumption made by Zhu et al. that all the impactor material reached the mantle was right or wrong. Hence, this will deepen the scope of the studies. Option D is the answer.                                                         Choice (D)

Q15.   Which of the following doesn't accurately represent the information directly or indirectly provided in the passage?


 a) Late accretion increases the concentration of some precious metals in the mantle of a planetary body.
 b) The cooling stage of the earth happened much before the onset of the hot, molten stage of the Moon.
 c) Theoretical estimates of late accretion mass of the moon are made assuming that half the impact mass is retained.
 d) The Solar System was formed more than 4.5 billion years ago.

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

Number of words: 638

Option A: This can be understood to be true from the sentences: '*Successive impacts* with other objects then *re-enrich the mantle* in these elements — *a process known as late accretion.*' Hence, Option A is not the answer.
Option B: It is understood that part of the deficit of precious metals on the moon is because of the loss to the core, because the moon was in a molten stage. However, from this information and from the fact that earth's mantle has greater abundance of precious metals, we cannot really be assured earth's cooling happened prior to that of the moon. Given that earth retained a lot more of the impact mass, it need not necessarily have cooled earlier than the moon to have a greater abundance of the precious metals. Hence, Option B is the answer.
Option C: From the sentence '*These models generally assume that the Moon retained about half of the mass* that was transferred to it by impactors' this information can be directly understood. Hence, Option C is not the answer.
Option D: Consider the sentences: '*It has also been suggested that the difference in precious-metal abundances between Earth and the Moon was caused by a drop in the flux of impacts during the period between 4.5 billion and 4.1 billion years ago, just after the Solar System formed.*' Hence, Option C is not the answer.

Choice (B)

DIRECTIONS for questions **16 to 18**: The passage given below is accompanied by a set of three questions. Choose the best answer to each question.

…Social scientists are inclined towards materialistic explanations…The alternative to this materialistic reductionism is to say that ideas matter…A non-material factor is cultural norms and social institutions…Economists prefer to examine people as individuals. However, individuals get their ideas mostly from other people. The world of mental phenomena is predominantly a cultural world. And these mental-cultural factors in social behaviour make economics less deterministic and less individualistic than many economists would prefer it to be…[T]his reduces the advantage of mathematical modelling relative to verbal reasoning. Also, mathematical modelling [may] wane due to the shifting media landscape. As of now, academic economists still must publish in journals to be successful, and these require mathematical modelling. However, in the age of the internet […] as economists increasingly make use of other forums, including social media, this may break the lock that print journals currently hold on career prospects. That in turn could facilitate more variety in the means of expression, breaking the monopoly currently held by mathematical modelling.
…[Also] related to the decline in the prominence of modelling is economists likely recognizing that, the simple model of homo economicus – portrayal of humans as agents who are consistently rational, narrowly self-interested – has only limited applicability. The biggest threat to the assumption of homo economicus is not alternative theories of individual psychology, such as those in behavioural economics. In fact, behavioural economics has been caught up in "replication crisis", an ongoing methodological crisis [because of] scientific studies being difficult

or impossible to replicate or reproduce. Rather, the need to go beyond the assumption of homo economicus will mostly arise from a recognition of the importance of culture as a determinant of behaviour…

Because ideas and cultural context matter, there are many potential causal factors in economic phenomena… Unfortunately, this means that it is possible for different economists to arrive at — and to stick with — different conclusions based on predilections…And this points to a plausible development in economic theory […] that over the next 20 years academic economics will congeal into a discipline, like sociology today, which is definitively shaped by an ideologically driven point of view. Among highly educated people, ideological polarization is increasing. Economists have always had their biases about which sorts of theories seemed reasonable; some of these biases are idiosyncratic... But going forward, biases are increasingly likely to be driven by political viewpoints rather than by other considerations…

Q16.   According to the author, what tilts the scales in favour of verbal reasoning compared to mathematical modelling is

 a) the extent to which cultural factors undermine the predictability of individualistic models.
 b) that the predictability of economics suffers because of the influence of mental-cultural factors in social behaviour.
 c) the desire amongst economists to steer the discipline away from determinism and individualism.
 d) the increasing influence of social media where verbal reasoning is a more important tool than mathematical modelling

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

Number of words:    395

The answer can clearly be found in the following lines: '*A non-material factor is cultural norms and social institutions...Economists prefer to examine people as individuals. However, individuals get their ideas mostly from other people.* **The world of mental phenomena is predominantly a cultural world**. *And these mental-cultural factors in social behaviour* **make economics less deterministic** *and less individualistic than many economists would prefer it to be...[T]his reduces the advantage of* **mathematical modelling** *relative to verbal reasoning.*'

Option A: The predictability of individualistic models is higher than the predictability of a predominantly cultural world. This has been established in the para above (because less deterministic a system less predictable it is). As predictability decreases and individuals get ideas from other individuals, verbal reasoning/language becomes more important than mathematical modelling (which is useful for predictable systems). So, it is not that culture lowers the predictability of the model. Culture makes economics itself less predictable, and hence, a deterministic model cannot be used. Hence, Option A is not the answer.

Option B: Mental-cultural factors in social behaviour makes economics less deterministic according to the author. This is because economics likes to look at individuals

(it is individualistic). By saying that individuals get their ideas from others, and that economics becomes less individualistic because of mental-cultural factors, the author is only trying to prove that mental cultural factors allow one individual to influence another. As a result, the social behaviour is not individualistic, but rather interdependent. Option B is the answer.

Option C: The effect of cultural factors makes **economics less deterministic than economists prefer it to be**. This is contradictory to the given option that the economists want to steer the field away from determinism (since they prefer it to be more deterministic and individualistic). Hence, Option C is not the answer.

Option D: The influence of social media has reduced the importance of mathematical modelling. However, that is not because of the increasing importance of verbal reasoning. The author doesn't link social media to verbal reasoning. Social media and increasing importance of culture (and hence, verbal reasoning) are two entirely different reasons. Hence, Option D is not the answer.                  Choice (B)

Q17.   Which of the following can be inferred from the author's argument about the waning importance of homo economicus?

 a) The theory of homo economicus considers the fact that humans accept ideas from other humans.

 b) The theory of homo economicus is more reliable than 'behavioural economics' which is plagued with a replication crisis.

 c) Culture may lead to overriding of choices derived from rational and self-interested motives.

 d) Mathematical modelling works even without the assumption of homo economicus.

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

Number of words: 395

This can be understood from the sentences: '...[Also] related to the likely decline in the prominence of modelling is economists likely recognizing that the simple model of homo economicus - portrayal of humans as agents who are consistently rational, narrowly self-interested - **has only limited applicability**. The biggest threat to the assumption of homo economicus is not alternative theories...Rather, **the need to go beyond the assumption of homo economicus will mostly arise from a recognition of the importance of culture as a determinant of behaviour**...'

Option A: The author's argument is that *homo economicus* doesn't take culture into account, the phenomenon through which decisions taken by humans are impacted by others. Hence, the statement that homo economicus considers the fact that humans accept ideas from other humans cannot be inferred from the author's argument. If anything, the author argues against it. Option A is not the answer.

Option B: The theory of homo economicus is not threatened by behavioural economics. That doesn't explain which of these two is more reliable or more unreliable. Hence, Option B is not the answer.

Option C: If culture is a determinant of behaviour and that threatens the assumptions of homo economicus, it means it is possible that culture could lead to overriding of self-interested/rational motives (which drives the theory of homo economicus). Hence, Option C is the answer.

Option D: If this were true, then mathematical modelling wouldn't have lost its importance once economics became less deterministic and the assumption of homo economicus was proven to be ineffective. Hence, this cannot be inferred from the passage. Option D is not the answer.                                    Choice (C)

Q18.   According to the author, the future of the discipline of academic economics will be

 a) ideologically driven due to the growing influence of political viewpoints in shaping ideas and cultural context.

 b) driven by the inherent idiosyncrasies and biases of economists which will find a channel in their theories.

 c) skewed by idiosyncrasies which will come to play a role in the thinking of economists subscribing to different cultures.

 d) shaped by the ideological polarization in the predilections of economists which will possibly outweigh other considerations in their theories.

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

Number of words: 395

Option A: Political viewpoints will become important because of the cultural context or cultural influence according to the author. Political viewpoints will not shape the cultural context. Hence, this option is incorrect.

Option B: As understood from '*Economists have always had their biases about which sorts of theories seemed reasonable; some of these biases are idiosyncratic*', biases and idiosyncrasies have always been around. The author's argument about the future of the academic economics discipline is about how these biases will be ideologically driven. Hence, Option B is not the answer.

Option C: The author's argument is not that idiosyncrasies would skew up their theories (the idiosyncrasies and biases have always been there). It is that the ideologies lying behind the idiosyncrasies, the political viewpoints, would skew up their theories, because those ideologies are shaped by cultural context. Hence, Option C is not the answer.

Option D: From '**_biases are increasingly likely to be driven by political viewpoints_** *rather than by other considerations*', we can understand that academic economics, according to the author, will be driven by ideologies and political viewpoints in their predilection (biases and idiosyncrasies), which will override other considerations. The author's closing argument is that there is always some bias, some idiosyncrasies in what economists believe. However, with the influence of culture and ideologies, their biases will be because of their thought processes/ideologies. Hence, political viewpoints (read as ideologies) would influence their biases, which means academic economics will congeal into a field that is ideologically driven (just as in the case of sociology). Hence, Option D is the answer. Choice (D)

DIRECTIONS for questions **19 to 24**: The passage given below is accompanied by a set of six questions. Choose the best answer to each question.

…Psychological medications such as Xanax, Ritalin and Aspirin help modify undesirable behaviours, thought patterns and the perception of pain. They purport to treat the underlying chemical cause rather than the social, interpersonal or psychodynamic causes of pathology. Self-knowledge gained by introspection and dialogue is no longer our primary means for modifying psychological states. By prescribing such medication, physicians are implicitly admitting that cognitive and behavioural training is insufficient and impractical, and that 'the brain', of which non-specialists have little explicit understanding, is in fact the level where errors occur. Indeed, drugs are reliable and effective because they implement the findings of neuroscience and supplement (or in many cases substitute for) our humanist discourse about self-development and agency. In using such drugs, we become transhuman hybrid beings who build tools into the regulatory plant of the body.

Recreational drugs, on the other hand, are essentially hedonic tools that allow for stress-release and the diminishment of inhibition and sense of responsibility. Avenues of escape are reached

through derangement of thought and perception; many find pleasure in this transcendence of quotidian experience and transgression of social norms…

In this historical moment, drugs fuel a culture where human nature is increasingly considered to be controllable through technology. But the essential question is this: do drugs enhance or diminish human agency, the ability to modulate one's own thought processes?

Whether a drug boosts attention, tamps down inhibitions or deranges the senses in service of euphoria, use can become ingrained and can spiral out of control until one can be said to be addicted to the effects of the drug. The overuse of recreational drugs and socially acceptable stimulants seems to negate, distort or inflate one's sense of agency, at which point an individual becomes dependent on drugs to cope in professional and social situations. In these cases, drugs, in the long term, are indeed counter-productive tools: they both occlude agency and compromise self-development.

Psychopharmacology implies that distinct mental illnesses are somehow natural kinds of personality formations defined by neurochemical profiles. For instance, in claiming that I have attention deficit hyperactivity disorder (ADHD) I am contextualising all my behaviours within a totalising abnormality that requires a pharmaceutical cure – a treatment beyond the capacities of my introspection and social support network. Practitioners prescribing such drugs in such a scenario are de facto technicians of the mind. They are easing our pain, but they are also dispensing cultural tools that allow us to selectively reduce or augment our sense of personal agency and power to set our own path.

One question to ask then is: How many individuals have found, through these tools, a sweet spot that blends augmentation of the will and alleviation of pain? If the number is large, then drugs fall into the same category as cars, electric guitars and mobile phones; tools that, if used judiciously, can ameliorate our quality of life. From that perspective, drugs are just one of many tools, including the tool of talk therapy, that serve to secure an appropriate sense of agency. And yet a somewhat worrisome consideration arises – maybe maintaining a sense of agency is not the best indicator of the appropriateness of a given tool. In our transhuman future, we are likely to abandon the psychodynamic tools of self-actualisation for cocktails offering the illusion of agency and escape.

Q19.   The tacit admission of physicians that the author alludes to in the first para can be invalidated if it is proven that:

 a) medication has a side-effect on cognitive and behavioural traits.
 b) introspection and dialogue can bring about positive changes in a person's psychological state.

c) undesirable behaviours and thought patterns have a chemical reason.    d) non-s

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

Number of words:    551

Consider the sentences: '*By prescribing such medication, __physicians are implicitly admitting that cognitive and behavioural training is insufficient and impractical__, and that 'the brain', of which non-specialists have little explicit understanding, is in fact the level where errors occur.*' The tacit (implicit) admission is that cognitive and behavioural training doesn't work against undesirable behaviours, and that the problem is at a more physical level. We need to pick an option that disagrees with it.
Option A: Whether medication is healthy/unhealthy/has side-effects deviates from the topic. We need to invalidate the admission that cognitive and behavioural training doesn't work against __undesirable behaviours, thought patterns and the perception of pain__. We need to invalidate the admission that there is a chemical rather than a social cause to these issues. So, the medication having side-effects doesn't do that. Hence, Option A is not the answer.
Option B: This clearly goes against the grain of the author's assumption that dialogue and introspection cannot change or help with issues that are more likely to have a chemical cause. Also, from '*Self-knowledge gained by introspection and dialogue is no longer our primary means for modifying psychological states*', we can understand that the author thinks physicians lean towards medication rather than introspection and dialogue. Hence, if proven, this option invalidates that tacit assumption of physicians.
Option C: If this is true, then the physicians are right in believing medication can solve it and not introspection/Cognitive and behavioural training. This is further corroborated by: '*__They purport to treat the underlying chemical cause rather than the social, interpersonal or psychodynamic causes of pathology__*'. This option reiterates the tacit admission rather than invalidate it. Hence, Option C is not the answer.
Option D: While this disagrees with what the author believes about physicians, it is not directly connected to the tacit admission of the physicians about what works and what doesn't with respect to undesirable behaviours and psychological states. Hence, Option D is not the answer.                                        Choice (B)

Q20.   The difference between psychological medications and recreational drugs is that:

a) the former aims to alter thinking, while the latter aims to disrupt it.
b) the former aids in introspection, while the latter aids in socializing.
c) the former induces responsible behaviour, while the latter induces carefree behaviour.
d) the former helps in restraining oneself, whereas the latter helps in reducing inhibitions.

Number of words:    551

Consider the sentences: '*Psychological medications such as Xanax, Ritalin and aspirin __help to modify undesirable behaviours, thought patterns and the perception of pain__. They purport to treat the underlying chemical cause rather than the social, interpersonal or psychodynamic causes of pathology.*'
Also consider: '...__Recreational drugs, on the other hand, are essentially hedonic tools that allow for stress-release and the diminishment of inhibition and sense of responsibility__. Avenues of escape are reached through derangement of thought and perception; many find pleasure in this transcendence of quotidian experience and transgression of social norms...'
Option A: The former (psychological medications) help modifying undesirable behaviours and thought patterns. Hence, it can be said that the former alters thought. Recreational drugs provide avenues of escape reached through derangement of thought. Hence, it is apt to say that the latter disrupts thought. Hence, Option A is the answer.
Option B: Psychological medications are an alternative to introspection according to the author. In other words, these medications are used because physicians do not trust introspection and dialogue to introduce positive change. So, the first part of this option is untrue. Option B is not the answer.
Option C: While the latter (recreational drugs) help one escape a sense of responsibility (a little far-fetched to say that it translates to carefree behaviour, nevertheless, not entirely wrong), it cannot be inferred or understood that psychological medications induce __responsible behaviour.__ Hence, Option C is not the answer.
Option D: While the latter (recreational drugs) help one shed inhibitions, it cannot be said that the former (psychological medication) helps one in restraining oneself. They only modify undesirable behaviour. Modify and restrain are words which are poles apart. Hence, Option D is not the answer.                    Choice (A)

Q21.   To 'build tools into the regulatory plant of the body' is:

 a) an analogy to describe the manipulation of brain for curing psychological issues and for recreation through medications.
 b) a metaphor for transforming human beings into hybrid beings who can be cured consistently of psychological illnesses through medication.
 c) a metaphor for modifying behaviour through the use of medication.
 d) an analogy for using medications as a way of modifying the functioning of the brain

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

Number of words:    551

Consider the sentences: '*Indeed, drugs are reliable and effective because they implement the findings of neuroscience and supplement (or in many cases substitute for) our humanist discourse about self-development and agency. **In using such drugs, we become transhuman hybrid beings who build tools into the regulatory plant of the body.***' It is important to understand that the 'brain' has been called the regulatory plant of the body.

Option A: Firstly, the terms 'tools' and 'manipulation' don't go well with each other. In case of tools, we are talking about 'fixing' an issue whereas in case of manipulation, it becomes subjective. Secondly, the author didn't use the expression in the context of recreational drugs (which comes later). This is important because recreational drugs aren't exactly tools of regulation. Hence, Option A is not the answer.

Option B: The given expression is an idea (grammatically represented as a clause). One idea compared to another idea (adopting psychological medications is like building tools into the regulatory plant) is not a metaphor, but an analogy. A metaphor is a comparison of objects, not ideas. Hence, Option B is not the answer.

Option C: It isn't a metaphor, but an analogy. Secondly, the comparison is not about modifying behaviour – rather it is about building a mechanism that can fix issues with the errors in the brain. Hence, Option C is not the answer.

Option D: The option is correct in that it is an analogy. Regulatory plant is a metaphor for the brain. Tools are a metaphor for the psychological medications. Building tools into the regulatory plant is the use of medications to fix issues with the brain. Hence, Option D is the answer.                                                      Choice (D)

Q22.   Which of the following best points out the author's reservations against using a sense of agency as the best indicator of appropriateness of a tool?

 a) Cocktails providing an illusion of free will might become more popular.
 b) The need for fulfilment of potential might be ignored in favour of pursuing the illusion of escape.
 c) It is not possible to blend both the augmentation of the will and alleviation of pain.
 d) Self-actualisation might be preferred to the illusion of agency and escape

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

Number of words:   551

Firstly, the author says, '*One question to ask then is: How many individuals have found, through these tools, a sweet spot that blends augmentation of the will and alleviation of pain?*' From this it can be understood that the author is okay with the right dose of medication for the right balance – reducing pain and enhancing will – to better/ameliorate the quality of life. The author then goes on to point out that '*And yet a somewhat worrisome consideration arises – <u>maybe maintaining a sense of agency is not the best indicator of the appropriateness of a given tool</u>. In our transhuman future, we are <u>likely to abandon the psychodynamic tools of self-actualisation</u> for cocktails offering the illusion of agency and escape.*' The author's concern is that if there are tools which can acquire the desired results of balance (a sense of agency), we will completely overlook the importance of psychodynamic tools of self-actualisation (the need or drive to realise one's potential). In other words, the cocktails offer a sense of escape, so we don't chase our dreams, so to speak.

Option A: Cocktails (metaphor for the tools which itself is a metaphor for the medications/talk therapy etc.) provide an illusion of escape. However, the author's concern is not just about their rising popularity. The author's concern is about the sense of escapism provided by them replacing human drive. That part has not been mentioned in this option. Option A is not the answer.

Option B: Consider the sentence: '*In our transhuman future, we are likely to abandon the <u>psychodynamic tools of self-actualisation</u> for cocktails offering the illusion of agency</u> and escape.*' So, the author's concern is that people will go for those drugs which will give them a sense of escape rather than going for the drugs that will help them reach out for self-actualisation. So, the need for fulfilment of potential (self-actualisation) might be ignored in favour of the need for pursuing the illusion of escape. Hence, Option B is the answer.

Option C: The author wonders if it can be blended someday. It is not stated anywhere that they cannot be blended. And then the author goes on to point out to the issue that arises when they are blended. Hence, Option C is not the answer.

Option D: The author's chief concern is that people will prefer the illusion of escape over self-actualisation. This choice states the opposite. Hence, Option D is not the answer.

Choice (B)

Q23.   The author's opinion about psychopharmacology is best summarised by which of the following?

a) Some abnormalities are beyond the healing powers of introspection and social support networks.

b) Through psychopharmacology, physicians are making individuals believe that drugs can give us a sense of agency.

c) Practitioners prescribing psychological medications help in easing the pain of individuals.

d) Contextualising behaviours within a totalising abnormality can help in curing mental ailments.

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

Number of words:    551

Consider the sentences: '*Psychopharmacology implies that distinct mental illnesses are somehow natural kinds of personality formations* **defined by neurochemical profiles**...*Practitioners prescribing such drugs in such a scenario are de facto technicians of the mind. They are easing our pain, but they are* **also dispensing cultural tools that allow us to selectively reduce or augment our sense of personal agency** *and power to set our own path.*' The author thinks psychopharmacology is based on the underlying assumption that we are what we are because of our neurochemical profiles – the manifestation of the chemicals in our brain. That belief leads to a sense of handing individuals a sense of agency – to intervene in a particular way to derive a particular effect or result.

Option A: Psychopharmacology may rule that 'some' abnormalities are beyond introspection/cognitive and behavioural modification. It simply assumes that medication can produce the desired effect. However, that is not the author's opinion. In fact, the author looks at the flip side of it, about how that could be an issue. Hence, Option A is not the answer.

Option B: This option aptly expresses the author's opinion, that physicians are effecting a cultural shift, where individuals think the brain can be tinkered with to produce the desired effect – reducing or augmenting our sense of personal agency as required. Hence, Option B is the answer.

Option C: The author's opinion is that while practitioners are easing an individual's pain, they are also going a step forward and dispensing 'a cultural tool' that makes individuals rely on medication rather than on alternative methods like introspection. Hence, Option C is not the answer.

Option D: Consider this: '*For instance, in claiming that I have attention deficit hyperactivity disorder (ADHD) I am contextualising all my behaviours within a totalising abnormality that requires a pharmaceutical cure – a treatment beyond the capacities of my introspection and social support network.*' So, we can say that psychopharmacology assumes that contextualising all behaviours within a totalising abnormality (and thus giving it a name, like say, ADHD, helps cure it using pharmaceuticals – assuming introspection wouldn't cure it). Once again, this is not the author's opinion and hence, not a good summary.                    Choice (B)

Q24.   Which of the following, if true, weakens the author's argument against using drugs?

 a) A person's capacity to reflect and push his or her own limits is accentuated by pharmaceutical cure.
 b) Psychological medication adversely affects a person's discretionary faculties.
 c) It is impossible to find the right balance of drugs that blend augmentation of will and alleviation of pain.
 d) Self-actualisation can only be achieved when one finds a way to ameliorate the quality of one's life.

Number of words: 551

The author's argument against drugs can be understood from the underlined portion here: 'In these cases, drugs, in the long term, are indeed counter-productive tools: they **both occlude agency and compromise self-development**.' So, drugs obstruct/occlude agency (a sense of thinking to produce a particular effect through decision-making) and also compromise/impede development of the self.

Option A: This option is in direct contradiction to the author's argument. The author has been building the argument that psychological medications/pharmaceutical cure is used as a way of directly manipulating the brain impeding introspection/dialogue/realising one's potential (primarily, indulging in thought to address one's issues rather than using medicine to treat issues as if they were neurochemical errors). However, this option states that even the ability to introspect or the idea of self-actualisation can be accentuated by pharmaceutical cure, which means drugs are good for agency and self-development. So, this option contradicts the author's concern. Hence, Option A is the answer.

Option B: This agrees with the author as can be understood from the following lines: 'Whether a drug boosts attention, tamps down inhibitions or deranges the senses in service of euphoria, **use can become ingrained and can spiral out of control** until one can be said to be addicted to the effects of the drug. The overuse of recreational drugs and socially acceptable stimulants seems **to negate, distort or inflate one's sense of agency**.' It can be seen that drugs if misused could adversely affect one's ability to think/discriminate. So, this option doesn't weaken the author's argument that drugs occlude agency and compromise self-development. Hence, Option B is not the answer.

Option C: This is tangential to the author's main argument. According to the author, even if we find the sweet spot, the balance between drugs enhancing one's will and reducing pain, it is not such a good idea to trade pursuing of self-actualisation for the escape drugs provide. So, if it is impossible to achieve such a balance, the author's argument is not weakened. Rather, it points to the inference that drugs cannot be designed to create a balance and there'll be spill-over negative effects, which the author alludes to as well. Option C is not the answer.

Option D: Even if this is true, it doesn't strengthen or weaken the author's argument, since it is not quite clear in this option, how an individual can ameliorate the quality of his or her life. In the passage, it is mentioned that drugs can enhance the quality of one's life, if used judiciously. But, since the option doesn't mention drugs, its essence boils down to achieving self-actualisation by improving the quality of life (which doesn't contradict the author/or go against the author's argument). Option D is not the answer.

Choice (A)

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

1. Reporting on what he found there, in an article for the New Masses, he proclaimed: "Everywhere the symbol of the hammer and sickle; some of it's pretty hasty, some of it's garlanded tropical bombast, but by God, it's painting."

2. The kind of painting that the novelist had in mind is epitomised by Diego Rivera's "Sugar Cane" (1931), a scene of plantation life filled with tropical scenery and plenty of bombast, and this will be a part of the exhibition.

3. In 1927, John Don Passos, an American writer and artist, returned from a long stay in Mexico where he had been soaking up the vibrant cultural scene south of the border.

4. "Paint the Revolution: Mexican Modernism 1910-1950", a fascinating exhibition that has just opened at the Philadelphia Museum of Art and will travel to the Museo del Palacio de Bellas Artes in Mexico City next year, takes its name from that essay and largely confirms the writer's judgment.

Sentence 1: Sentence 1 contains the pronouns 'he' and 'there'. It also mentions the person's comment.
Sentence 2: Sentence 2 has a reference to 'the novelist' and it also provides details of a painting.
Sentence 3: Sentence 3 sounds like an introductory sentence of a paragraph. It has the year, the name of the person, his profession and mentions his return from a particular location.
Sentence 4: Sentence 4 mentions the name of an exhibition and other details related to it. It also mentions some clues 'that essay' and 'writer's judgment'.
On a careful reading of the sentences, it can be observed that though sentence 4 has the name of an exhibition, it cannot begin the paragraph as it has a reference to 'that essay' which needs a precedent. So, among the four sentences, sentence 3 is the best sentence to begin the paragraph. It introduces the American writer and artist and provides the background of the story. Sentence 3 is followed by sentence 1. The pronoun 'he' in sentence 1 refers to 'John Don Passos'. The pronoun 'there' stands for 'Mexico'. "Reporting on what he found there" in sentence 1 links with "John Don Passos, an American writer and artist, returned from a long stay in Mexico" in sentence 3. "Everywhere the symbol of the hammer and sickle; some of it's pretty hasty, some of it's garlanded tropical bombast" in sentence 1 links with "soaking up the vibrant cultural scene south of the border" given in sentence 3. So, 31.
It can also be inferred that sentence 4 (which mentions the name of the exhibition) has to precede sentence 2 (and this will be a part of the exhibition).
Sentence 1 is followed by sentence 4. "takes its name from that essay" in sentence 4 links with "article for the *New Masses*" in sentence 1. "largely confirms the writer's judgment" in sentence 4 links with "some of it's pretty hasty, some of it's garlanded tropical bombast, but by God, it's painting" in sentence 1.
Now, sentence 4 is followed by sentence 2. "The kind of painting that the novelist had in mind is epitomised by Diego Rivera's "Sugar Cane" (1931)" in sentence 2 is parallel to "takes its name from that essay and largely confirms the writer's judgment" given in sentence 4 and also links with " Reporting on what he found there, in an article for the *New Masses*, he proclaimed: "Everywhere the symbol of the hammer and sickle"" in sentence 1. "The kind of *painting* ….. scene of plantation life filled with tropical scenery and plenty of bombast, and this will be a part of the **exhibition**" in sentence 2 links with "fascinating **exhibition**" in sentence 4 and "some of it's pretty hasty, some of it's garlanded tropical bombast, but by God, it's *painting*" given earlier in sentence 1. So, 3142.                                          Ans: (3142)

Q26.  DIRECTIONS for question **26**: In the following question, there are sentences or fragments of sentences that form a paragraph. Identify the sentence(s) or fragments of sentence(s) that is/ are correct in terms of grammar and usage, including spelling, punctuation and logical consistency. Enter the number corresponding to the sentence(s) or fragments of sentence(s) in the input box provided below the question. [Note: Enter your answer in increasing

order only. For example, if you think that the fragments (2) and (4) are correct, then enter 24 (but not 42) in the input box.]

1. As a blind prophet, the observatory perched atop Cerro Pachón in Chilean Andes ponders the heavens.
2. Eyeless for now, the Large Synoptic Survey Telescope (LSST) will from 2022 turn into the biggest digital camera on Earth. Taking 3,200 megapixel snaps with
3. an exposure time of 15 seconds, to capture an area 40 times the size of the full moon, the LSST will map almost the entire southern hemisphere once every three nights,
4. for a decade. The picture so generated will assess how matter, in the form of stars and galaxies, are distributed,
5. shedding light about the clash of forces that have bought the universe to its current state, and thus scrying its future.

Part (1): In part (1), the conjunction 'as' needs to be replaced with the preposition 'like'. 'Like' is to used to show similarity and is followed by a noun or pronoun. Here, the observatory is compared to a blind prophet. Also, 'Chilean Andes' needs to be preceded by the article 'the'.
Part (2): Part 2 has errors of punctuation. There are commas necessary in various places. Part (2) should read: Eyeless for now, the Large Synoptic Survey Telescope (LSST) will, from 2022, turn into the biggest digital camera on Earth.
Part (3): Part (3) has no grammatical errors.
Part (4): Part (4) has an error of subject-verb agreement. 'matter' is a singular noun and it needs a singular verb. So, 'are' needs to be replaced with 'is'. The part should read: matter, in the form of stars and galaxies, is distributed,
Part (5): 'shed light about' is incorrect. The idiom 'shed light on' must be used. It means 'to help to explain (something) by providing further information about it.' Also, 'bought' needs to be replaced with 'brought'.
The correct answer is (3).                                                    Ans: (3)

Q27.  DIRECTIONS for question **27**: In the question, there are six sentences, with each sentence having a pair of words, numbered 1 and 2, that are italicized and highlighted. In each sentence, from the pairs of italicized and highlighted words, select the appropriate word to form the correct sentence. Then enter (in the input box provided below the question) the correct sequence of numbers corresponding to the appropriate words in each of the sentences, in the same order that the sentences appear in the question. For example, if you think that the appropriate words for the sentences are 1, 2, 1, 2, 1 and 2 respectively, then enter your answer as 121212.

i.   An honest person cannot dissemble (1) / disassemble (2) his true feelings.
ii.  Novak Djokovic has a penchant (1) / perchance (2) for performing well in crucial matches.
iii. As he is not good at catching the niceness (1) / niceties (2) in the behaviour of his colleagues, Raju is often misunderstood as being sarcastic.
iv.  The weary traveller decided to rest awhile (1) / a while (2) before proceeding with his arduous journey.

v. My mother who accompanied me to Stephen Hawking's lecture "Questioning the Universe" at the Tata Institute of Fundamental Research, Mumbai, found the talk too obtuse (1) / abstruse (2) to understand.

vi. While talking to us about the state of historical monuments in our country, our class teacher suddenly went on a tangent making an allusion (1) / illusion (2) to the works of Pable Picasso

(i) The verb 'dissemble' means to put on the appearance of, to hide under a false appearance. The verb 'disassemble' means to take something apart. In the given context, only 'dissemble' makes sense. So, 1.

In sentence (ii), 'penchant' is the correct answer. 'Penchant' means a strong liking for something, inclination, propensity, proclivity etc. 'Perchance' means by chance, perhaps or possibly. Novak Djokovic has a *passion* or penchant for performing well... Hence 1.

(iii) 'Niceties' means details (The quality of showing or requiring careful, precise treatment) and 'niceness' means the condition or state of being nice (pleasing and agreeable in nature). Here (2) is apt.

(iv) 'Awhile' means a short while. The word 'a while' does not indicate a short period of time unless it is used along with little. So, (1).

(v) 'Abstruse' means difficult to understand. The adjective 'obtuse' is good for describing someone slow on the uptake, not quick or alert in perception. My mother would have found the talk difficult to understand. Hence (2).

(vi) 'Allusion' means making a reference to something or someone else, 'illusion' is defined as a process involving an interaction of logical and empirical considerations. Common usage suggests that an 'illusion' is a discrepancy between one's awareness and some stimulus. The teacher made a reference to Pablo Picasso. So (1) is appropriate.

Hence, 112121.                                           Ans: (112121)

Q28.  DIRECTIONS for question **28**: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the four sentences and key in the sequence of four numbers as your answer, in the input box given below the question.

1. For decades, this has meant that products have had to be "designed for manufacture", which essentially means their components must incorporate features that can be readily shaped by machines in order to be glued, screwed or welded together by people or robots.

2. The beautifully sculpted "concept" cars that regularly appear at motor shows never get built, at least not in the form they left the design studio, because they are inevitably too difficult and expensive to engineer for mass production.

3. Now, a combination of powerful computer-aided design (CAD) software and new manufacturing methods is changing the game: CAD systems rather than technical drawings and blueprints are used to conceive new products.

4. When great designs are turned into products, compromises are made

Sentence 1: Sentence 1 has a starter "this has meant that".
Sentence 2: Sentence 2 mentions the reason why "concept" cars that regularly appear at motor shows never get built.
Sentence 3: Sentence 3 has the time sequence indicator "Now" and another clue "changing the game".
Sentence 4: Sentence 4 is a standalone sentence. It mentions what happens when designs are turned into products.
Sentence 4 is a standalone sentence that cannot be placed later in the paragraph as it will disturb the thoughtflow. "**great designs** are turned into products" in sentence 4 is contrasted by ""**beautifully sculpted "concept" cars** that regularly appear at motor shows never get built, at least not in the form they left the design studio" in sentence 2. Also, "compromises are made" in sentence 4 links with "inevitably too difficult and expensive to engineer for mass production" in sentence 2. So "great designs" (sentence 4) are "too difficult and expensive to engineer for mass production" (sentence 2).
Sentences 2 and 1 form a logical block. [Because "concept cars" or "great designs" are inevitably too difficult and expensive to engineer for mass production] (Sentence 2), [products have had to be "designed for manufacture"] (sentence 1). "must incorporate features that can be readily shaped by machines in order to be glued, screwed or welded together by people or robots" in sentence 1 contrasts "never get built, at least not in the form they left the design studio" in sentence 2. So, sentence 1 follows sentence 2.
Sentence 3 concludes the paragraph. "is changing the game" in sentence 3 contrasts "For decades, this has meant that" in sentence 1. So 3 follows 1. Hence, 4213.

Ans: (4213)

Q29.  DIRECTIONS for question **29**: In the following question, there are sentences or fragments of sentences that form a paragraph. Identify the sentence(s) or fragments of sentence(s) that is/ are correct in terms of grammar and usage, including spelling, punctuation and logical consistency. Enter the number corresponding to the sentence(s) or fragments of sentence(s) in the input box provided below the question. [Note: Enter your answer in increasing order only. For example, if you think that the fragments (2) and (4) are correct, then enter 24 (but not 42) in the input box.]

1. Pericles was a prominent and influential Greek statesman, orator and general of Athens during it's golden age – specifically the time between the Persian and the Peloponnesian wars.
2. He was descended, through his mother, from the powerful and historically influential Alcmaeonid family.
3. Pericles had a profound influence on Athenian society that Thucydides, a contemporary historian, acclaimed him as "the first citizen of Athens".
4. Pericles promoted the arts and literature; it is principal through his efforts that Athens acquired the reputation of being the educational and cultural center of the ancient Greek world.
5. He started an ambitious project that generated most of the surviving structures in the citadel of the Acropolis (including the Parthenon).

Part 1: In part (1), "it's" is incorrect. "It's" needs to be replaced with the possessive pronoun 'its'.
Part 2: Part (2) has no errors in grammar and usage.
Part 3: Part (3) needs the construction "such .... that". Part 3 should be changed to read: Pericles had **such** a profound influence on Athenian society **that** Thucydides
Part 4: In part (4), the adjective 'principal' does not make any sense and it needs to be replaced with the adverb 'principally'.
Part 5: Part (5) has no errors in grammar and usage.
The correct parts or fragments are (2) and (5).                                    Ans: (25)

Q30.  DIRECTIONS for question **30**: In the question, there are six sentences, with each sentence having a pair of words, numbered 1 and 2, that are italicized and highlighted. In each sentence, from the pairs of italicized and highlighted words, select the appropriate word to form the correct sentence. Then enter (in the input box provided below the question) the correct sequence of numbers corresponding to the appropriate words in each of the sentences, in the same order that the sentences appear in the question. For example, if you think that the appropriate words for the sentences are 1, 2, 1, 2, 1 and 2 respectively, then enter your answer as 121212.

  i.   Our most difficult experiences become the crucible (1) / crucifix (2) that forge our character and develop the internal powers, the freedom to handle difficult circumstances in the future and to inspire others to do so as well.
  ii.  Governments across the world should make a conscious effort to spread awareness about the insidious (1) / invidious (2) effects of global warming.
  iii. With inflation reaching unprecedented levels, the common man comprehends (1) / apprehends (2) that he may not be able to make both ends meet.
  iv.  The subordinate's fructuous (1) / fatuous (2) behaviour was laughable and invited the ire of his boss.
  v.   The thieves took the curfew to be a nugatory (1) / nuggety (2) one and hence, they did not give any importance to its observance.
  vi.  It is ingenuous (1) / ingenious (2) to suppose that there was no vested interest in his decision.

(i) In sentence (i) , 'Crucible' means a severe test, a place or situation that forces people to change or make difficult decisions. 'Crucifix' means a representation of a cross with a figure of Christ on it. Our most difficult experiences become a testing platform for us. So, (1).

(ii) 'Insidious' means proceeding in a gradual, subtle, crafty way, but with very harmful effects. 'Invidious' means likely to arouse or incur resentment or anger in others. The effects of global warming are harmful. So (1) is correct.

(iii) 'Comprehend' is to understand, 'apprehend' is to fear. Hence the latter makes sense. So, (2).

(iv) In sentence iv, 'Fructuous' means full of or producing a great deal of fruit, productive or fertile. 'Fatuous' means not having or showing an ability to absorb ideas readily, foolish or complacent manner. If his behaviour invited the loathsomeness of his boss, it is fatuous or foolish. Hence (2).

(v) Nugatory is trivial; of little or no importance; trifling. Nuggety is rugged, thickset, stocky. Hence (1).

(vi) Ingenuous means artless, genuine, guileless, honest, unpretentious. Ingenious means having the skill and imagination to create new things, clever and inventive. Here there is no reference to creativity or inventiveness. One would be guileless (in the given context) to suppose....So (1).

The correct answer is 112211.                                                    Ans: (112211)

Q31.   DIRECTIONS for question **31**: 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.  As I grew into the habit of analysing myself – in fact, it became a favourite pastime – I began to suspect that my obsession with miniatures stemmed from a desire for control: that it felt good to contain things.
2.  This impulse was not unrelated to another developing desire to encapsulate the world through storytelling, to construct stories like little dioramas.
3.  Perhaps children are particularly drawn to miniatures because they have no choice but to navigate the world as something built to a scale they don't share.
4.  "Every narrative is a miniature", writes the literary critic Susan Stewart, and I loved both from early on.

Sentence 1 is an independent sentence bereft of connector words, pronouns or conjunctive adverbs, about the author's obsession for miniatures.

Sentence 2 refers to a previous sentence using 'this' pointing to an impulse probably mentioned in an earlier sentence. It also introduces storytelling.

Sentence 3 is an independent sentence about why children are drawn to miniatures. This is quite similar to the structure and logic of Sentence 1.

Sentence 4 has a quote that connects miniatures and stories (narrative) and talks about the author's love for both – stories and miniatures.

Since the author admits to a love for miniatures and storytelling, and since Sentence 2 talks about storytelling and another impulse, that impulse has to be the love of miniatures. So, 12 is a logical block. Sentence 4 talks about the author's love for both. So, ideally 412 would have been a block. However, Sentence 3 talks about children's love for miniatures, which will not make any sense at the end of the para, because second part of Sentence 2 talks about storytelling. 4123 therefore, doesn't make sense.

4312 doesn't make sense either because 4 talks about the author's love and so does the 12 block. These two blocks shouldn't be separated by an alien sentence focusing on children in general.

Since 3 talks about children, and 1 talks about the author's growing habit, 3 best precedes the 12 block. 3412 wouldn't make sense either because 4 which talks about both – stories and miniatures – cannot interrupt the link between 3 and 1 (children and the author being attracted to miniatures). Hence, the only possible logical place for 4 is as the conclusion of the para.                                              Ans: (3124)

Q32. DIRECTIONS for question **32**: In the following question, there are sentences or fragments of sentences that form a paragraph. Identify the sentence(s) or fragments of sentence(s) that is/are correct in terms of grammar and usage, including spelling, punctuation and logical consistency. Enter the number corresponding to the sentence(s) or fragments of sentence(s) in the input box provided below the question. [Note: Enter your answer in increasing order only. For example, if you think that the fragments (2) and (4) are correct, then enter 24 (but not 42) in the input box.]

1. Some heartbreaks are beautiful, some are good, and some are downright ugly.
2. The season finale of Game of Thrones was an ugly heartbreak due to the way it throws a spanner on years of character development and carefully designed subplots.
3. The Cricket World Cup Final is an example of a good heartbreak, although keeping everyone on knife's edge until the last moment.
4. Many Indians continued to support the Kiwis, even though it was they who had ended the march of the Indian team to the tournament Final.
5. The Wimbledon Final is an example of a beautiful heartbreak, for not many a player in the history of the game has shown the poise Roger Federer displayed in the face of a defeat he didn't deserve.

Q33. DIRECTIONS for question **33**: In the question, there are six sentences, with each sentence having a pair of words, numbered 1 and 2, that are italicized and highlighted. In each sentence, from the pairs of italicized and highlighted words, select the appropriate word to form the correct sentence. Then enter (in the input box provided below the question) the correct

sequence of numbers corresponding to the appropriate words in each of the sentences, in the same order that the sentences appear in the question. For example, if you think that the appropriate words for the sentences are 1, 2, 1, 2, 1 and 2 respectively, then enter your answer as 121212.

i. The emotionally affective (1) / effective (2) content in Murakami's novels stays with you long after you've consigned the book to grandma's trunk.

ii. There is historic (1) / historical (2) precedent to suggest that companies make blunders when it comes to identifying trendsetting ideas which are priceless.

iii. Iron Man is a hero to a generation that believes being nonchalant (1) / nonplussed (2) in the face of danger is cool.

iv. Few booklovers condone (1) / castigate (2) the protagonist's obsession in Nabokov's Lolita, despite its poetic language.

v. Uninterested (1) / disinterested (2) umpiring has ensured that cricket has stayed clean and clear of bias.

vi. Many universities choose to proscribe (1) / prescribe (2) Salman Rushdie's Satanic Verses to steer away from any controversy still lingering around its subject.

Sentence 1 is incorrect because a comma is placed after an independent clause. Some heartbreaks are beautiful is a completed clause and, hence, must be followed by either a period (.), a semi-colon (;), or a comma followed by a coordinating conjunction: For, And, Nor, But, Or, Yet, So (FANBOYS). A comma isn't used to connect two independent clauses.

Sentence 2 has an error in idiomatic usage of 'due to' which translates to 'caused by'. 'Due to' is used to modify a noun and not the reason for a 'verb'. The correction here is 'The season finale of Game of Thrones was an ugly heartbreak **because of** the way it throws a spanner...'

Sentence 3 has an error because of the incorrect usage of a subordinate conjunction – although. It should be followed by a completed clause. Here it isn't followed by a completed clause as the subject is missing. The correction is 'The Cricket World Cup Final is an example of a good heartbreak, although **it kept** everyone on knife's edge until the last moment.'

Sentence 4 has an error because of ambiguous pronouns. 'They' may refer to the Kiwis as well as to the Indians. The correction is 'even though it was **the Kiwis/the latter** who had ended the march'.

Sentence 5 has no grammar errors. 'many a player...has' although intimidating is correct.                                                        Ans: (5)

(i) Affective is something that affects the mood emotionally. Effective is something that produces results. So, it is 1.
(ii) Historic is something that happens for the first time in history, or which is creating history. Historical is something that has a context in history, something that is old. So, it is 2.
(iii) Nonchalant is staying relaxed and unaffected/imperturbable. Nonplussed is being baffled, a negative word. So, it is 1.
(iv) Condone is supporting something (which is generally negative). Castigate is harsh criticism. 'Despite its poetic language' shows that we need a negative word in the first part (since few booklovers equates to 'no one'. 'A few' means some). Hence, it is 1.
(v) Uninterested means bored/absence of interest. Disinterested is the absence of bias/neutral. So, it is 2.
(vi) Proscribe means to 'ban'/prohibit. Prescribe is to recommend. Since, the universities want to steer away from any controversy with its subject, they will proscribe it. So, it is 1.                                      Ans: (121121)


Q34.   DIRECTIONS for question **34:** In the following question, there are sentences or fragments of sentences that form a paragraph. Identify the sentence(s) or fragments of sentence(s) that is/ are correct in terms of grammar and usage, including spelling, punctuation and logical consistency. Enter the number corresponding to the sentence(s) or fragments of sentence(s) in the input box provided below the question. [Note: Enter your answer in increasing order only. For example, if you think that the fragments (2) and (4) are correct, then enter 24 (but not 42) in the input box.]

1.  A global obsession, superhero movies are seen by hundreds of millions, arguably the most consumed stories in human history.
2.  We can trace the changing status of women, evolving ideas about masculinity, war, crime, journalism, the C.I.A. or anything else by Hollywood treatments over the decades.
3.  Logan, the most gritty and realistic of 2017's top movies, works as an allegory for America's ongoing struggle against racism and on the pull of paternity and tribe in the face of oppression.
4.  The extraordinary success of "Black Panther" rests in part on creating a counter-myth to centuries of racist depictions of Africa, where it sets a hidden kingdom wiser and more technologically advanced than the wildest visions of Afro-Centrism.
5.  Most of the others fail to make sense even within the fantastical logic of their own worlds — why, for instance, do superheroes and villains hurl large objects at each other, when this, clearly, has no effect?

Sentence 1 is incorrect for misplaced modifier (Misplaced modifiers are created when a modifier is placed next to a word or phrase other than the one it is intended to modify, creating an illogical or even absurd meaning). From the sentence it isn't clear whether 'arguably the most consumed stories' applies to hundreds of millions or to superhero movies. Ideally, it should have been: 'Superhero movies, arguably the most consumed stories in human history, are seen by hundreds of millions.' Similarly, 'A global obsession' is a dangling modifier, since what follows this has no relation to this phrase. Superhero movies are not a global obsession. Watching those movies probably refers to that obsession.

Sentence 2 has a parallelism issue. It should have been: We can trace (the changing status of women), **_and_** (evolving ideas about masculinity, war, crime, journalism, the C.I.A. or anything else) by Hollywood treatments over the decades. The phrases 'the changing status of women' and 'evolving ideas about masculinity' have the same status. But, then separated by commas are a bunch of other words and it is not quite clear what the author wants to do with those.

Sentence 3 is wrong because 'gritty' has a superlative form, grittiest. It should have been 'grittiest and most realistic'.

Sentence 4 is wrong because of mistaken pronoun. In this sentence: The extraordinary success of "Black Panther" rests in part on creating a counter-myth to centuries of racist depictions of Africa, where **_it_** sets a hidden kingdom wiser and more technologically advanced… Here it is not clear what is 'it'. It could be Africa/Black Panther/counter-myth/pretty much any noun that comes before it.

Sentence 5 is correct.                                                      Ans: (5)

# AIMCAT 2014 LRDI

DIRECTIONS *for questions 1 to 4:* Answer the questions on the basis of the information given below. Kranti plotted a scatter chart which provides information on two metrics – Shortz Index and Lenat Index – for a certain number of countries. For any country, the product of Shortz Index and Lenat Index divided by 100 is called Fame Index (FI) of the country, while the Shortz Index divided by the Lenat Index is called the Infamy Index (II) of that country.

The scatter chart plotted by Kranti is provided below:
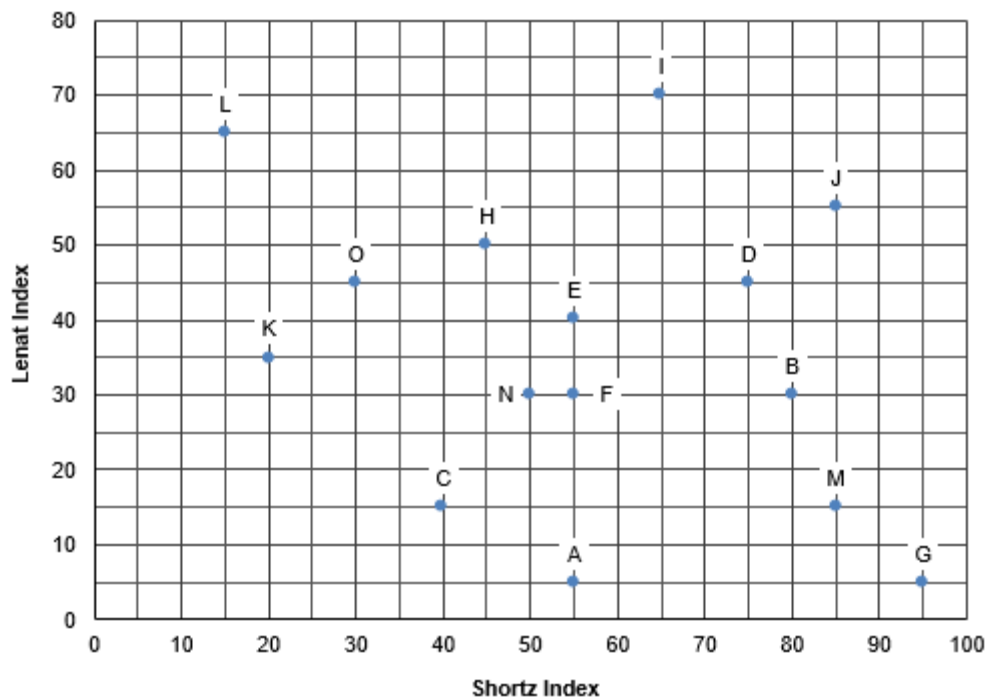


Q1. DIRECTIONS *for questions 1 and 2:* Type in your answer in the input box provided below the question.
For how many countries is its FI greater than that of country F?

The FI of any country can be calculated using the area that the point that represents the country forms with the two axes.

The FI of F $= \dfrac{\text{Total Number of grids under F}}{4} = \dfrac{11 \times 6}{4} = \dfrac{66}{4}$

For each country, we can count the number of grids that the point that represents that country forms with the axis. If it is greater than 66, then that country will satisfy the given condition.

The number of grids is greater than 66 for B (96), E (88), H (90), D (135), J (187) and I (182).

Hence, for 6 countries, the FI is greater than that of F.                      Ans: (6)

Q2.   DIRECTIONS *for questions 1 and 2:* Type in your answer in the input box provided below the question.

For how many countries is its II greater than its FI?

$\text{II} = \dfrac{\text{SI}}{\text{LI}} \times 100$

$\text{FI} = \text{SI} \times \text{LI}$

Given that $\text{II} > \text{FI}$

$\Rightarrow \dfrac{\text{SI}}{\text{LI}} \times 100 > \text{SI} \times \text{LI}$

$\Rightarrow \text{LI}^2 < 100$

$\Rightarrow \text{LI} < 10$

Only two countries, A and G, satisfy this condition.                      Ans: (2)

Q3.   DIRECTIONS *for questions 3 and 4:* Select the correct alternative from the given choices.

The ratio of FI to II is called the Social Standing Index (SSI) of the country.

What is the highest SSI of any country?

a) 36

b) **42.25**

c) **49**

d) 30.25

$$FI = \frac{SI \times LI}{100}$$

$$II = \frac{SI}{LI} \Rightarrow SSI = \frac{SI \times LI}{100} \times \frac{LI}{SI} = \frac{LI^2}{100}$$

The country with the highest LI will have the highest SSI.

The country with the highest LI is I and its SSI = $\frac{70 \times 70}{100}$ = 49          Choice (C)

Q4.  DIRECTIONS *for questions 3 and 4:* Select the correct alternative from the given choices. The ratio of FI to II is called the Social Standing Index (SSI) of the country.

For how many of the given countries is its SSI less than its II?

a) 3

b) **4**

c) **5**

d) 6

G has the highest II of any country, which 19.

The SSI of G = $\frac{25}{100}$

A has the next highest II, which is 11.

The SSI of A = $\frac{25}{100}$

M has the next highest II, which is $\frac{85}{15}$ = 5.67

The SSI of M = $\frac{225}{100}$ = 2.25

C has the next highest II, which is $\frac{40}{15}$ = 2.67

The SSI of C = 2.25

B has the same II as C, which is 2.67 but its SSI = 9. Hence, B does not satisfy the given condition.

F has the next highest II, which is $\frac{55}{30}$ = 1.83

The SSI of F = 9.

Hence, F also does not satisfy the given condition.

All the other countries have higher LI, which implies a higher SSI and a lower II than the countries above. Hence, none of the other countries will satisfy the given condition.

∴ Only four countries, G, A, M and C, have II greater than SSI.          Choice (B)

DIRECTIONS *for questions 5 to 8:* Answer the questions on the basis of the information given below. Two students, Harish and Lalit, were asked by their teacher, Karthik, to memorize the population of five states – A through E. However, each student only memorized the population of four of the five states.

Karthik then gave two different sets of True or False questions on the populations of the five states, one each to Harish and Lalit. For any question, if Harish can deduce the answer to any question with the information that he memorized, he answered that question correctly. Otherwise, he guessed a random answer. For any question, if Lalit can deduce the answer to any question with the information that he memorized, he intentionally answered that question incorrectly. Otherwise, he guessed a random answer.

Each of Harish and Lalit were able to deduce the answers to exactly four questions with the information that they memorized.

The following is the set of questions given to each of them and the answers that they gave:

| Harish | | Lalit | |
|---|---|---|---|
| Q1 | The population of B greater than that of A. | Q1 | The population of C is 20 mn more than that of B. |
| Ans | *True* | Ans | *False* |
| Q2 | The population of A is 20 mn. | Q2 | The population of E is 30 mn. |
| Ans | *True* | Ans | *True* |
| Q3 | The population of D is less than that of C. | Q3 | The population of A is 10 mn more than that of D. |
| Ans | *False* | Ans | *False* |
| Q4 | The population of E is 40 mn. | Q4 | The population of B is 40 mn. |
| Ans | *True* | Ans | *True* |
| Q5 | The population of C is 10 mn more than that of E. | Q5 | The difference in population of C and E is 20 mn. |
| Ans | *False* | Ans | *False* |
| Q6 | The population of C is 50 mn. | Q6 | The population of E is less than that of D. |
| Ans | *True* | Ans | *False* |

Q5. DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
What is the population of E?

a) 20 mn

b) **30 mn**

c) **50 mn**

d) 70 mn

Q6.  DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
If the population of no two states is the same, which of the following states would have the highest
population?

a) B

b) **C**

c) **D**

d) A

Q7.  DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
What is the minimum possible sum of the population of the five states?

a) 220 mn

b) **210 mn**

c) **240 mn**

d) 200 mn

Q8.  DIRECTIONS *for questions 5 to 8:* Select the correct alternative from the given choices.
The answer given by Lalit to which question would Karthik definitely evaluate as correct?

a) Q2

b) **Q3**

c) **Q6**

d) Q4

Given that Harish and Lalit know the population of exactly 4 states.

Consider the statements given to Harish.

If Harish did not know the population of A, then he must know the populations of the remaining 4 states. With this information, he can answer Q3, Q4, Q5 and Q6 correctly. However, if he correctly answered Q4, Q5 and Q6, there is an inconsistency as he says that the population of E is 40 mn and the population of C is 50 mn but the population of C is not 10 mn more than that of E. Hence, he could not have answered all these three questions correctly. Hence, A cannot be the state for which he does not know the population.

If he does not know the population of B or D, a similar inconsistency will arise.

If he does not know the population of C, then he cannot know the answer to Q3, Q5 and Q6. Hence this is not possible.

If he does not know that population of E, then he cannot know the answer to Q4 and Q5. This is the only possibility.

Hence, his answers to Q1, Q2, Q3 and Q6 are all correct.

∴ The population of A is 20 mn and the population of C is 50 mn. The population of B must be greater than 20 mn and the population of D must be at least 50 mn.

For Lalit, if he did not know the population of A, he would have known the answers all the questions except Q3. Hence, this is not possible.

If he did not know the population of B, he could not have known the answer to two questions, Q1 and Q4. Hence, this case is possible.

If he did not know the population of C, he could not have known the answer to two questions, Q1 and Q5. Hence, this case is possible.

If he did not know the population of D, he could not have known the answer to two questions, Q3 and Q6. Hence, this case is possible.

If he did not know the population of E, he could not have known the answer to three questions, Q2, Q5 and Q6. Hence, this is not possible.

Consider that Lalit did not know the population of B. Hence, he must have incorrectly answered Q2, Q3, Q5 and Q6. He answered Q3 as false, which implies that the statement must be true. Since the population of A is 20 mn, the population of D must be 10 mn. However, the population of D must be greater than 50 mn. Hence, this case is not possible.

Consider that Lalit did not know the population of C. Hence, he must have incorrectly answered Q2, Q3, Q4 and Q6. Since he answered Q3 incorrectly, we will get the same inconsistency as above. Hence, this case is also not possible.

Consider that Lalit did not know the population of D. He must have incorrectly answered Q1, Q2, Q4 and Q5.

From Q1, we get that the population of B is 30 mn (since the statement in Q1 is True).

From Q2, we get that the population of E is not 30 mn.

From Q4, the population of B is not 40 mn.

From Q5, the population of E can be 30 mn or 70 mn. Since it cannot be 30 mn, the population of E must be 70 mn.

Hence, Lalit did not know the population of D and neither do we.

∴ The populations of A, B, C and E are 20 mn, 30 mn, 50 mn and 70 mn respectively. The population of D must be at least 50mn.
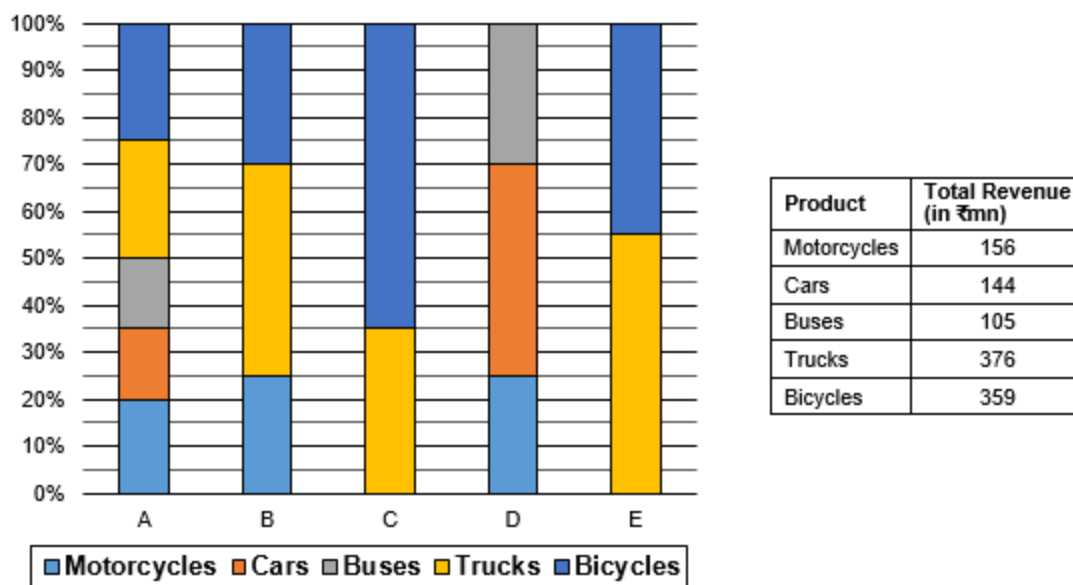
Lalit answered Q1, Q2, Q4 and Q5 incorrectly. He answered Q3 as False and Q6 as False. For Q6, the population of E can be more than that of D, if the population of D is, say, 60 mn.

However, for Q3 to be true, i.e., for the population of A to be be 10 mn more than that of D, the population of D can be at most 10 mn, which is not possible. Hence, the statement given in Q3 is definitely false, which is the answer given by Lalit. Hence, Lalit definitely answered Q3 correctly.                    Choice (B)

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

Five companies – A through E – sells one or more products among Motorcycles, Cars, Buses, Trucks and Bicycles. No company sells any product other than the above-mentioned five and the revenue of any company from any product that it sells is not zero. The bar graph below provides, for each company, the percentage of revenue from each product that it sells. The table provided alongside the bar graph provides, for each product, the total revenue of all the companies, among the five, that sell that product.



| Product | Total Revenue (in ₹mn) |
|---|---|
| Motorcycles | 156 |
| Cars | 144 |
| Buses | 105 |
| Trucks | 376 |
| Bicycles | 359 |

Q9.  DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
What is the revenue of company B from selling Trucks?

a) Rs.45 mn

b) **Rs.90 mn**

c) **Rs.99 mn**

d) Rs.105 mn

Q10.   DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
Which company has the highest revenue?

a) A

b) **C**

c) **D**

d) E

Q11.   DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
What is the highest revenue of any company from selling Bicycles?

a) Rs.165 mn

b) **Rs.144 mn**

c) **Rs.120 mn**

d) Rs.105 mn

Q12.   DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
For how many companies is the revenue from any product that they sell more than Rs.50 mn?

a) 5

b) **4**

c) **3**

d) 2

Let a, b, c, d and e represent the total revenues of companies A, B, C, D and E, respectively.
Given that the total revenue from selling Motorcycles is ₹156 mn.
Hence, $0.2a + 0.25b + 0.25d = 156$ ---------- (1)
Similarly, $0.15a + 0.45d = 144$ ---------- (2)
$0.15a + 0.3d = 105$ ---------- (3)
$0.25a + 0.45b + 0.35c + 0.55e = 376$ ---------- (4)
$0.25a + 0.3b + 0.65c + 0.45e = 359$ ---------- (5)
From (2) and (3), $a = 180$ and $d = 260$.
From (1), $b = 220$.
$(4) \Rightarrow 0.35c + 0.55e = 232$
$(5) \Rightarrow 0.65c + 0.45e = 248$
Solving the two equations, we get $c = 160$ and $e = 320$.
The following table provides the revenue from each company in each product:

| Company | Motorcycles | Cars | Buses | Trucks | Bicycles | Total |
|---------|-------------|------|-------|--------|----------|-------|
| A | 36 | 27 | 27 | 45 | 45 | 180 |
| B | 55 | 0 | 0 | 99 | 66 | 220 |
| C | 0 | 0 | 0 | 56 | 104 | 160 |
| D | 65 | 117 | 78 | 0 | 0 | 260 |
| E | 0 | 0 | 0 | 176 | 144 | 320 |

The given condition is satisfied for four companies, B, C, D and E.        Choice (B)
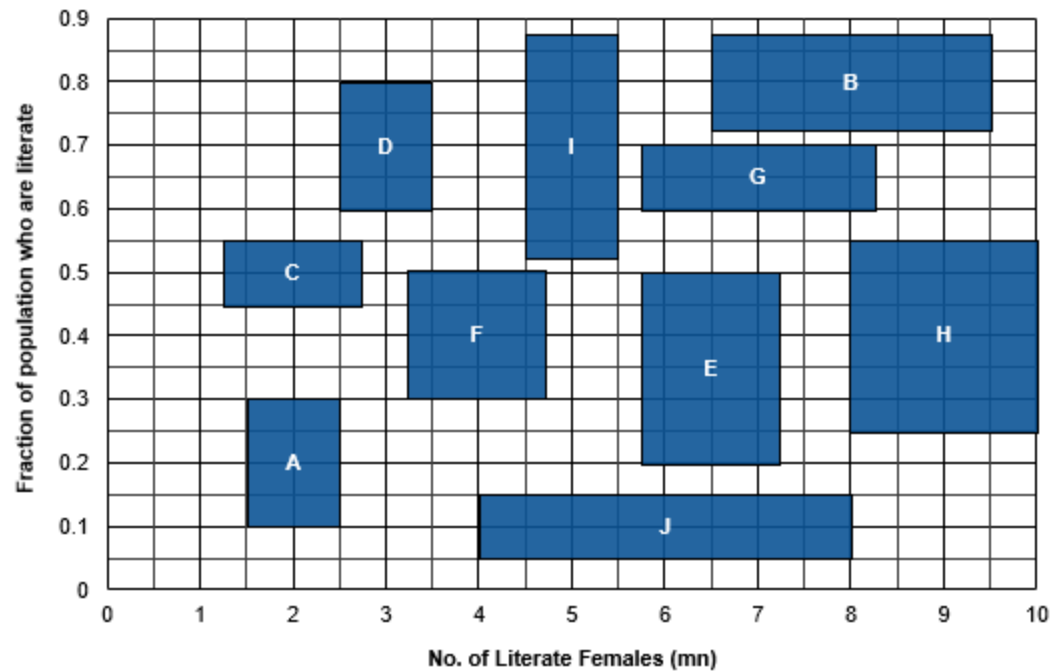

DIRECTIONS *for questions 13 to 16:* Answer the questions on the basis of the information given below.

In the following chart, the number of literate females and the fraction of population who are literate is provided for ten countries – A through J. The number of literate females (in mn) is given along the horizontal axis, while the overall literacy percentage is provided along the vertical axis. Further, each country is represented by a rectangle whose width (i.e., along the horizontal axis) is proportional to the number of males in the country and whose height (along the vertical axis) is proportional to the literacy percentage among males in the country.

For each country, the centre of the rectangle represents the number of literate females and the overall literacy percentage.

Note: The number of literate males in A is 400,000 and the number of illiterate males in A is 600,000.

Fraction of population who are literate

0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0

0  1  2  3  4  5  6  7  8  9  10

No. of Literate Females (mn)

Labels in plot: A, B, C, D, E, F, G, H, I, J

Q13.   DIRECTIONS *for questions 13 and 14:* Select the correct alternative from the given choices.
Which of the ten countries has the highest population?

a) E

b) **B**

c) **H**

d) J

Q14.   DIRECTIONS *for questions 13 and 14:* Select the correct alternative from the given choices.
Which of the ten countries has the second highest number of females?

a) J

b) **E**

c) **H**

d) A

Q15.   DIRECTIONS *for questions 15 and 16:* Type in your answer in the input box provided below the question.
What is the population (in mn) of country F?


Q16.   DIRECTIONS *for questions 15 and 16:* Type in your answer in the input box provided below the question.
What is the number of illiterate males (in mn) in country G?


Given that the number of literate males in A is 400,000 and the number of illiterate males in A is 600,000. The total number of males in A is 1 mn and the literacy rate among males is 40%. From the rectangle that represents A, we can infer that, along the horizontal axis, two gridlines indicate 1 mn male population and, along the vertical axis, four gridlines indicate 40% male literacy rate.
Hence, for A, we know that the number of males is 1 mn, the number of literate males is 0.4mn and the number of literate females is 2 mn. The total number of literates = 2.4 mn
The overall literacy percentage = 20%
Total population = 2.4/0.2 = 12 mn
For B, the number of males is 3 mn, the male literacy rate is 30%, the number of literate females is 8 mn and the overall literacy rate is 80%.
The total number of literates = 0.9 + 8 = 8.9
Total population = 8.9/0.8 = 11.125 mn
Similarly, we can calculate these values for all the countries, which is provided in the table below:

| Country | No. of males (mn) | Male Literacy Rate | No of Female Literates (mn) | Overall Literacy Rate | Total no of Literates (mn) | Total Population (mn) |
|---------|-------------------|--------------------|-----------------------------|-----------------------|----------------------------|-----------------------|
| A | 1 | 40% | 2 | 20% | 2.4 | 12 |
| B | 3 | 30% | 8 | 80% | 8.9 | 11.125 |
| C | 1.5 | 20% | 2 | 50% | 2.3 | 4.6 |
| D | 1 | 40% | 3 | 70% | 3.4 | 4.857 |
| E | 1.5 | 60% | 6.5 | 35% | 7.4 | 21.143 |
| F | 1.5 | 40% | 4 | 40% | 4.6 | 11.5 |
| G | 2.5 | 20% | 7 | 65% | 7.5 | 11.538 |
| H | 2 | 60% | 9 | 40% | 10.2 | 25.5 |
| I | 1 | 70% | 5 | 70% | 5.7 | 8.143 |
| J | 4 | 20% | 6 | 10% | 6.8 | 68 |

The number of illiterate males in G = 2                                    Ans: (2)

Note: This question can be answered by calculating the required parameter for G alone.

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

In the month of November 2018, Piyush, a class teacher, kept track of the number of children that were present in his class on each of the thirty days of the month. The number of children in the class on any day varied by at most 8 between any two consecutive days. Further, on a particular day of the month, the number of children in the class was four, which was the minimum number of children present in the class on any day of the month. Further, the number of days for which the number of children present in the class was n was exactly n – 3.

Q17. DIRECTIONS *for questions 17 and 18:* Type in your answer in the input box provided below the question.
What is the maximum possible number of children present in the class on any day?

Given that the minimum number of children in the class on any day was 4.
Further, the number of days in which 4 children can be in the class is 4 – 3 = 1
Since the number of children can vary by at most 8 between any two consecutive days, the next highest number of children can be 4 + 8 = 12.
If there are 12 children, then there must be 12 children in the class for 9 days. The next highest number of children can be 20 and this must be for 17 days.
The total number of days till now = 1 + 9 + 17 = 27 days.
We cannot consider 28 children to be present (as there are only 30 days in November).
Consider the case where there are 21 children. The number of days for this must be 18.
Since there must be 4 children on 1 day, we can work backwards from 21. The next lowest number of children will be 21 – 8 = 13 for 10 days.
The next lowest must be 5 children for 2 days. Then we can have 4 children for 1 day.
The total number of days in this case = 1 + 2 + 10 + 18 = 31.
Hence, it is not possible to have 21 children in the class (or any other higher number).
The maximum number of children in the class must be 20.                    Ans: (20)

Q18. DIRECTIONS *for questions 17 and 18:* Type in your answer in the input box provided below the question.
If the highest number of children present in the class on any day was $x$, what is the lowest possible value of $x$?

We need to minimize the maximum number of children in the class.
Given that there are 4 children for 1 day. There will be 5 children for 2 days, 6 children for 3 days and so on until 11 children for 8 days. We cannot increase the number of children from this because the total number of days becomes 36. We cannot decrease the number of children to less than this because the number of days will not reach 30. Hence, we need to remove 6 days, which can be done if remove the case where 9 children are in the class, for 6 days.
Therefore, the least possible value of $x$ is 11.                                    Ans: (11)

Q19.  DIRECTIONS *for questions 19 and 20:* Select the correct alternative from the given choices.
If the number of children in the class was $n$ for exactly eleven consecutive days and on any other day, the number of children in the class was not $n$, what is the maximum possible number of children in the class on any day?

a) 18

b) **17**

c) **19**

d) 20

Since the number of children remained the same for 11 consecutive days, the number of children in this case must be at least 14.
To maximize the number of children in the class on any day, there must be 6 children in the class for 3 days and 4 children in the class for 1 day.
This leaves $30 - 11 - 3 - 1 = 15$ days.
Hence, there can be 18 children in the class for 15 days.                     Choice (A)

Q20.  DIRECTIONS *for questions 19 and 20:* Select the correct alternative from the given choices.
If the number of children in the class was $n$ for ten days, from November 1$^{st}$ to November 10$^{th}$, and on any other day, the number of children in the class was not $n$, what is the maximum possible number of children in the class on any day?

a) 16

b) **15**

c) **17**

d) 18

Given that the number of children remained the same from November 1ˢᵗ to November 10ᵗʰ. Hence, there must be 13 children in the class for these 10 days.
Also, there must be 4 children in the class for at least 1 day.
To maximize the number of students in the class, on November 11ᵗʰ, we can consider that at most 13 + 8 = 21 students attended the class. However, we cannot accommodate 4 students on any day with this arrangement. Further, if we consider that there are 17 students from 11ᵗʰ to 24ᵗʰ, there must be 9 students for 6 days. In this case also, there cannot be 4 students on any day. However, if there are 16 students from 11ᵗʰ to 23ʳᵈ, there can be 9 students for 6 days, from 24ᵗʰ to 29ᵗʰ, and 4 students on 30ᵗʰ. Hence, this case is possible and the maximum number of students in the class on any day is 16.                                                                Choice (A)
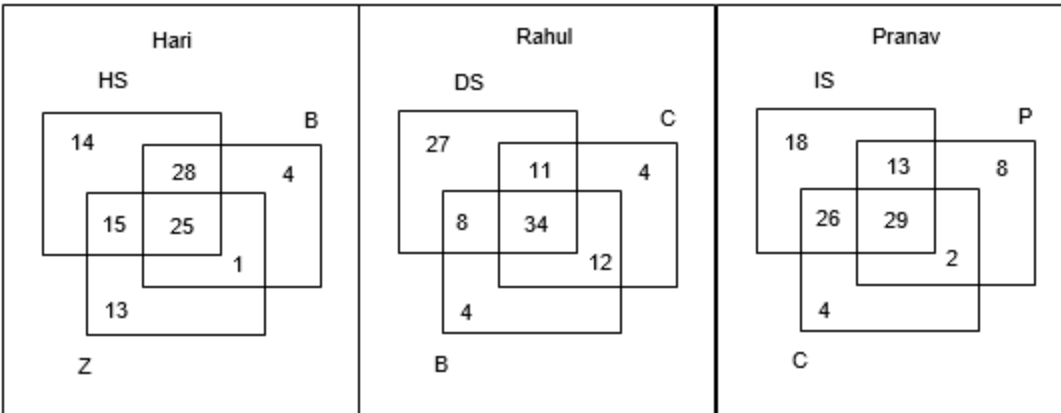
DIRECTIONS *for questions 21 to 24:* Answer the questions on the basis of the information given below.

Hari, Rahul and Pranav were analysing data on the number of students in a class who like each subject among Chemistry, Physics, Botany and Zoology. Each student in the class likes at least one of these four subjects.

- ○ Hari classified the four subjects into three groups – Hard Science (HS) comprising Chemistry and Physics as one group, Botany (B) as a separate group and Zoology (Z) as a separate group.
- ○ Rahul also classified the four subjects into three groups – Dull Subjects (DS) comprising Zoology and Physics as one group, Chemistry (C) as a separate group and Botany (B) as a separate group.
- ○ Pranav also classified the four subjects into three groups – Important Subjects (IS) comprising Botany and Zoology as one group, Physics (P) as a separate group and Chemistry (C) as a separate group.

Any student who likes at least one subject in a group is said to have a preference for the group. Each of Hari, Rahul and Pranav made a Venn diagram, which is provided below, providing information on the number of students who have a preference for the groups that he has defined.

Hari — HS, B, Z: 14, 28, 4, 15, 25, 1, 13

Rahul — DS, C, B: 27, 11, 4, 8, 34, 12, 4

Pranav — IS, P, C: 18, 13, 8, 26, 29, 2, 4

**Q21.** DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.
How many students like only Physics and Zoology?

a) **4**

b) **5**

c) **6**

d) 7

**Q22.** DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.
What is the minimum number of students who like both Chemistry and Zoology?

a) **27**

b) **29**

c) **25**

d) 23

**Q23.** DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.
What is the maximum possible number of students who like all the four subjects?

a) **15**

b) **13**

c) **27**

d) 20

Q24.  DIRECTIONS *for questions 21 to 24:* Select the correct alternative from the given choices.
If the number of students who like both Chemistry and Zoology is 30, how many students do not like only Chemistry?

a) **3**

b) **4**

c) **5**

d) 6

Let the adjacent Venn diagram represent the number of students who have a preference for each of the four subjects.

We can find the following values by observing the three Venn diagrams:

From the first Venn diagram, the number of students who like only Botany = **a = 4**

The number of students who like only Zoology = **c = 13**

The number of students who like only Botany and Zoology = **b = 1**

From the second Venn diagram, the number of students who like only Chemistry = **d = 4**

The number of students who like only Chemistry and Botany = **g = 12**

From the third Venn diagram, the number of students who like only Physics = **f = 8**

The number of students who like only Physics and Chemistry = **e = 2**

From the first Venn diagram, the number of students who like at least one of Chemistry and Physics (Hard Science) and no other subjects = d + e + f = 14

The number of students who like at least one of Chemistry and Physics and Botany but do not like Zoology = g + j + m = 28

Since g = 12, **j + m = 16**          --------- (1)

The number of students who like at least one of Chemistry and Physics and Zoology but do not like Botany = **i + l + o = 15**.          --------- (2)

The number of students who like at least one of Chemistry and Physics and both Zoology and Botany = **h + k + n = 25**          --------- (3)

From the second Venn diagram, the number of students who like at least one of Zoology and Physics and no other subjects = c + f + o = 27

Since c = 13 and f = 8, **o = 6**.

The number of students who like at least one of Zoology and Physics along with Chemistry but not Botany = i + l + e = 11 ⇒ **i + l = 9**          --------- (4)

The number of students who like at least one of Zoology and Physics along with Botany but not Chemistry = b + m + n = 8 ⇒ **m + n = 7**          --------- (5)

The number of students who like at least one of Zoology and Physics and both of Botany and Chemistry = **h + j + k = 34**          --------- (6)

From the third Venn diagram, the number of students who like at least one of Zoology and Botany and no other subjects = a + b + c = 18

The number of students who like at least one of Zoology and Botany and like Physics but not Chemistry = m + n + o = 13

The number of students who like at least one of Zoology and Botany and like Chemistry but not Physics = g + h + i = 26. Since g = 12, h + i = 14          --------- (8)

The number of students who like at least one of Zoology and Botany and like both Chemistry and Physics = **j + k + l = 29**          --------- (9)
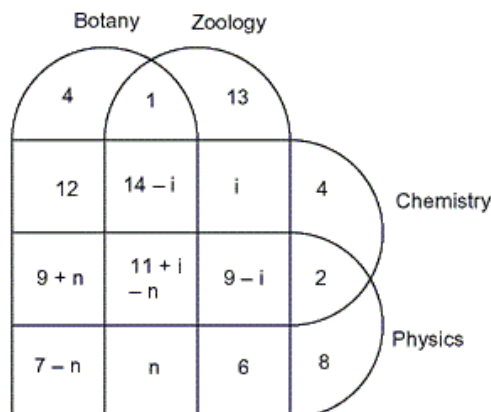
From (5), m = 7 − n
From (1), j = 9 + n
From (4), l = 9 − i
From (8), h = 14 − i
From (3), h + k + n = 25 ⇒ 14 − i + k + n = 25 ⇒ k = 11 + i − n

The following Venn diagram provides the value of all the cells in terms of i and n:

The number of students who like both Chemistry and Zoology = 14 − i + i + 11 + i − n + 9 − i = 34 − n

Given that 34 − n = 30 ⇒ n = 4

Number of students who do not like only Chemistry = Number of students who like all the other three subjects = n = 4.          Choice (B)

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

Five horses – Whispering Death, Nice Guy, Pony Express, Black Knight and Lazy Suzy – participated in a race. Each horse had a different jockey among Jack, Rory, Ted, Philip and Westin. Further, the shirt of each jockey was of a different colour among Blue, Red, Yellow, Green and Pink.

It is also known that

    i.   Jack's shirt was Green, while the shirt of Black Knight's jockey was Red.
    ii.   The jockey of Lazy Suzy was Philip and his shirt was not Blue.
    iii.   Ted's shirt was not Blue, while Westin was not the jockey of Nice Guy.
    iv.   The shirt of Whispering Death's jockey was not Blue, while Rory's shirt was Yellow.

Q25.   DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.
Who was the jockey of Pony Express?

a) **Jack**

b) **Rory**

c) **Ted**

d) **Westin**

What was the colour of the shirt of Lazy Suzy's jockey?

Q26.   DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.
a) **Green**

b) **Pink**

c) **Yellow**

d) **Cannot be determined**

Q27.   DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.
Who was the jockey of Black Knight?

a) **Jack**

b) **Westin**

c) **Ted**

d) **Rory**

Q28.   DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.
If the colour of the shirt of Whispering Death's jockey was not Green, who was the jockey of Nice Guy?

a) **Rory**

b) **Westin**

c) **Ted**

d) **Jack**

From (i), Jack's shirt was Green. From (iv), Rory's shirt was Yellow. From (ii) and (iii), Philip's shirt and Ted's shirt are not Blue. Hence, Westin's shirt must be Blue and Philip's shirt and Ted's shirt must be Red and Pink, in any order.

From (i), the shirt of Black Knight's jockey was Red. Between Philip and Ted, only Ted can be the jockey of Black Knight (because from (ii), the jockey of Lazy Suzy was Philip).

Hence, Ted's shirt is Red and Philip's shirt is Pink.

From (iii), Westin is not the jockey of Nice Guy. He is also not the jockey of Whispering Death (from (iv), since Westin's shirt is blue). Hence, Westin must be the jockey of Pony Express.

Jack and Rory must be the jockeys of Whispering Death and Nice Guy, in any order.

The following table provides the name of the horse, its jockey and the colour of the jockey's shirt:

| Jockey | Shirt Colour | Horse |
|--------|-------------|-------|
| Jack | Green | Whispering Death/Nice Guy |
| Philip | Pink | Lazy Suzy |
| Ted | Red | Black Knight |
| Rory | Yellow | Nice Guy/Whispering Death |
| Westin | Blue | Pony Express |

The colour of the shirt of Whispering Death's jockey was not Green. Hence, Jack is the jockey of Nice Guy.

Choice (D)

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

In a hockey match between Metropolis Magnates and Gotham Gators, exactly six players, A through F, scored goals. The number of goals scored by them were 3, 4, 7, 9, 10 and 12, not necessarily in the same order. Of the six players, three players played for Metropolis Magnates, while three players played for Gotham Gators.

It is also known that

    i.   no other player scored any goal between the first and last goal that A scored. The same is the case with B, C and D.

    ii.   the last goal that C scored was the $10^{th}$ goal of the match, while B scored more than three goals.

    iii.  exactly 12 goals were scored after D scored his last goal.

    iv.  the first person to score a goal for Metropolis Magnates scored the last five goals of the match.

v.  the last person to score a goal for Gotham Gators scored the first five goals of the match.
vi.  A, who played for Metropolis Magnates, scored his first goal after B scored his last goal.
vii.  F, who played for Gotham Gators, scored less goals than E.
viii.  the number of goals scored by Metropolis Magnates and Gotham Gators (in that order) at different points of the match are as follows: 6-5, 6-11 and 14-11.

Q29.  DIRECTIONS *for questions 29 and 30:* Type in your answer in the input box provided below the question.
How many goals did D score?

Q30.  DIRECTIONS *for questions 29 and 30:* Type in your answer in the input box provided below the question.
What is the total number of goals scored by Metropolis Magnates?

Q31.  DIRECTIONS *for questions 31 and 32:* Select the correct alternative from the given choices.
How many goals were scored by both the teams combined before A scored his last goal?

a) **21**

b) **23**

c) **25**

d) **29**

Q32.  DIRECTIONS *for questions 31 and 32:* Select the correct alternative from the given choices.
If it can be said that B definitely scored the $n^{th}$ goal of the match, how many values can n take?

a) **1**

b) **2**

c) **0**

d) **3**

A total of 45 goals were scored in the match. Let the goals be numbered 1 to 45, in the order that they were scored.

From (i), each of A, B, C and D scored all their goals consecutively.

From (iv) and (v), the two persons who could have scored goals at the beginning and at the end are E and F (as every other player scored all their goals consecutively and no one scored exactly five goals). Further, E and F must be from opposite teams.

From (vii), F is from Gotham Gators and E is from Metropolis Magnates.

Hence, goals 1 to 5 were scored by F for Gotham Gators.

From (viii), the score was 6-5. Hence, the goals 6 to 11 must have been scored by Metropolis Magnates. From (ii), C scored the 10th goal. Hence, C must be from Metropolis Magnates. From (vi), A is also from Metropolis Magnates. Hence, E, C and A play for Metropolis Magnates, while F, B and D play for Gotham Gators.

Goal 6 must have been scored by E since he scored the first goal for Metropolis Magnates (from iv). Further, since C's last goal was goal 10, he must have scored either 3 or 4 goals in total. Hence, goals 8 to 10 must definitely have been scored by C. Goal 7 could have been scored by C or E.

From (viii), the score went from 6-5 to 6-11. Hence, goals 12 to 17 must have been scored by Gotham Gators. From 6-11 the score went to 14-11. Hence, goals 18 to 25 must have been scored by Metropolis Magnates.

Goals 12 to 17 could not have been scored by D as D scored the 33rd goal and must have scored all goals consecutively. (D could not have started scoring from 17th goal till 33rd goal consecutively as the maximum number of goals any one scored was only 12).

Hence, either F or B must have scored goals 12 to 17. If F scored all these goals, then F must have scored a minimum of 12 goals (5 goals at the beginning, the last goal for Gotham Gators and 6 goals here). However, this violates (vii). Hence, this is not possible. B must have scored some of the goals 12 to 17. B could have scored a total of 3 or 4 goals, while F must have scored 3 or 2 goals. From (ii), B scored 4 goals (any consecutive goals between 12 and 17) and F scored 2 goals.

Since B scored 4 goals, C must have scored 3 goals. Everyone else must have scored 7 or 9 or 10 or 12 goals.

Goals 18 to 25 must have been scored by either E or A. E already scored goal 6 and 7. He will score five more goals at the end of the match. He alone cannot score all the goals from 18 to 25 as he will have to score a minimum of 2 + 5 + 8 = 15 goals, which is not possible. Hence, A must have scored at least one goal among goals 18 to 25.

Goals 33 was scored by D. If D scored 7 goals, then D must have scored goals 27 to 33. If D scored 9 goals, D must have scored goals 25 to 33. Since goals 25 was scored by Metropolis Magnates, D must have scored 7 goals, goal 27 to 33.

A must score a minimum of 9 goals. If A scored 9 goals, then A must have scored goals 18 to 26. Since D scored the 27th goal, A must have scored exactly 9 goals.

From (vii), E and F must have scored 12 and 10 goals, respectively.

Since E scored the last five goals of the match, goals 41 to 45 must have been scored by E. E scored a total of 3 + 5 = 8 goals (goals 6 and 7, goal 11, goals 41 to 45). Hence, E must score 4 more goals.

F scored a total of 5 + 2 goals (goals 1 to 5, two goals between goals 12 to 17). F must score 3 more goals.

Of the goals 34 to 40, E must score 4 goals and F must score 3 goals.

The following table provides the goal number (1 to 45) and the player that scored the goal:

| Goal # | Player | Team | Score (MM-GG) |
|--------|--------|------|---------------|
| 1 – 5 | F | GG | 0 – 5 |
| 6 – 7 | E | MM | 2 – 5 |
| 8 – 10 | C | MM | 5 – 5 |
| 11 | E | MM | 6 – 5 |
| 12 – 17 | F (2); B (4) | GG | 6 – 11 |
| 18 – 26 | A | MM | 15 – 11 |
| 27 – 33 | D | GG | 15 – 18 |
| 34 – 40 | E (4); F (3) | MM/GG | 19 – 21 |
| 41 – 45 | E | MM | 24 – 21 |

B scored 4 consecutive goals between goals 12 and goal 17. Hence, B could have scored goals 12 to 15 or goals 14 to 17. In either case, B would have definitely scored goal 14 and goal 15.

Hence, n can take 2 values.                                    Choice (B)

# AIMCAT 2014 QA

Q1.  DIRECTIONS *for question 1:* Type in your answer in the input box provided below the question.
A number M has exactly six factors. If the reciprocal of each factor of M is a terminating number, then how many values can M assume?

Any terminating number must have its denominator (in the lowest terms) in the form $2^a5^b$.
Thus the number must be of the form $2^a5^b$. since it has 6 factors the possible forms of the number are as follows : $2^5$ or $5^5$ or $2^2 \times 5^1$ or $2^1 \times 5^2$.
Hence, there are four such numbers.                                                    Ans: (4)

Q2.  DIRECTIONS *for questions 2 to 4:* Select the correct alternative from the given choices.
Which of the following numbers given in the octal system is divisible by 7?

a) $(23765)_8$

b) $(24625)_8$

c) $(45326)_8$

d) $(36453)_8$

$(abcde)_8 = 8^4a + 8^3b + 8^2c + 8d + e$
$= 4095a + 511b + 63c + 7d + a + b + c + d + e$
$= 7(585a + 73b + 9c + d) + a + b + c + d + e$.
For the above number to be divisible by 7,
$(a + b + c + d + e)$ must be divisible by 7.
Of the given options, only $(36453)_8$ is divisible by 7.
**Note:** In general, for any number in base '*n*' to be divisible by $(n - 1)$, the sum of the digits must be divisible by $(n - 1)$.                                                    Choice (D)

Q3.  DIRECTIONS *for questions 2 to 4:* Select the correct alternative from the given choices.
The total cost of a product includes two parts – the production cost and the marketing cost. If the production cost and the marketing cost increase by 20% and 30% respectively, the total cost increases by 28%. The marketing cost is how many times the production cost?

a) **2**

b) **3**

c) $\dfrac{3}{2}$

d) **4**

Let the initial cost of production and marketing be denoted by P and M respectively.
Initial total cost = P + M
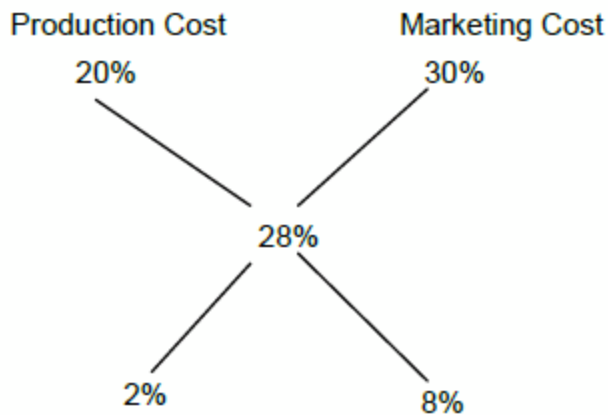Final total cost = 1.2P + 1.3M = 1.28 (P + M)
$\Rightarrow$ 0.02M = 0.08P

$$\frac{M}{P} = \frac{0.08}{0.02} = \frac{4}{1}$$

$\therefore M = 4P$

**Alternative Solution:**

Using approach of alligations



Production Cost        Marketing Cost
   20%                 30%

28%

   2%               8%

$$\frac{\text{Production Cost}}{\text{Marketing Cost}} = \frac{2}{8} = \frac{1}{4}$$

Therefore, the marketing cost is 4 times the production cost.          Choice (D)

Q4.   DIRECTIONS *for questions 2 to 4:* Select the correct alternative from the given choices.
The difference of the digits of a two-digit number is 8. How many such numbers exist?

a) **2**

b) **4**

c) **5**

d) **3**

Let the number be ab
If a > b, difference of a and b = a − b
If a < b, difference of a and b = b − a
If a > b, a − b = 8. ∴ (a, b) = (9, 1) or (8, 0)
If a < b, b − a = 8. ∴ (a, b) = (1, 9)
ab = 91 , 80 or 19.                                  Choice (D)

Q5.   DIRECTIONS *for question 5:* Type in your answer in the input box provided below the question.
There is a family comprising a father and a mother, along with six children – A, B, C, D, E and F.

They have to attend a party, for which they decide that only one among the father or the mother can

attend, along with any number of children, subject to the following constraints:

    a.   Neither B nor C will go along with their mother.
    b.   F goes, only if A or D goes.

In how many different ways can the family attend the party?

If the father attends the party each child can either attend the party or not attend the party i.e., each child has 2 options.
Therefore for 6 children we get
$\Rightarrow$ (2) (2) (2) (2) (2) (2) = $2^6$ = 64 ways
If the mother attends the party, the total numbers of ways = 2 × 2 × 2 × 2 = $2^4$ (as B or C won't attend the party with their mother)
F doesn't go when none of A or D attend
$\Rightarrow$ F does not go with B, C, E
(with Father) $\Rightarrow$ 2 × 2 × 2 $\Rightarrow$ 8 ways should be removed from 1$^{st}$ case
(with Mother) $\Rightarrow$ 2 ways should be removed from 2$^{nd}$ case as F will not go with E.
$\Rightarrow$ Required number of ways = 64 + 16 – 8 – 2 = 70

**Alternative Solution:**

Considering only A, D, F, and using the condition (b), we have the following cases
(None of A, D, F); (F, A); (F, D); (F, A, D); (A); (D); (A, D); i.e., 7 ways.
Now considering B, C and E
(i)   with father: each of B, C and E can either go or not go i.e., 2 × 2 × 2 = 8 ways
(ii)  with mother: E can either go or not go, i.e., in 2 ways.
Hence, B, C, E have 8 + 2 = 10 ways of going and A, D, F have 7 ways
∴ Total ways = 10 × 7 = 70 ways.                                                      Ans: (70)

Q6.   DIRECTIONS *for questions 6 to 11:* Select the correct alternative from the given choices.
The income of A is Rs.15,000 and it is equal to the expenditure of B. If the ratio of the savings of A to the savings of B is 2 : 1, which of the following statements is definitely true?

a) **The combined income of A and B is more than Rs.45,000.**

b) **The combined expenditure of A and B is not less than Rs.20,000.**

c) **A's expenditure added to twice of B's income is equal to Rs.45,000.**

d) **B's expenditure added to twice of A's income is equal to Rs.30,000.**

As the income of A is Rs.15000, the expenditure of B is also Rs.15000. Let the expenditure of A be $a$ and the income of B be $b$, then (15000 – $a$) = 2($b$ – 15000)
$\Rightarrow$ 2$b$ + $a$ = 45000                                                      Choice (C)

Q7.   DIRECTIONS *for questions 6 to 11:* Select the correct alternative from the given choices.

The lengths of the sides of a triangle are 11 cm, 14 cm and 19 cm. If each side of the triangle is increased by 20%, then what is the percentage increase in the product of the circumradius and the inradius of the triangle?

a) **21%**

b) **20%**

c) **44%**

d) **None of the above**

If each side of a triangle is increased by 20%, its inradius and circumradius will also increase by 20% each. So, the required product becomes (1.2) (1.2), i.e., 1.44 times the original product.

∴ The product of the circumradius and the inradius increases by 44%.       Choice (C)

Q8.   DIRECTIONS *for questions 6 to 11:* Select the correct alternative from the given choices.
S = {1, 2, 3………, 400}. For how many non-empty subsets of S is the product of the elements of the subset equal to an even number?

a) $2^{400} - 2^{300}$

b) $2^{400} - 2^{100}$

c) $2^{400} - 2^{200}$

d) $2^{200}$

Number of non-empty subsets of any set having N elements = $2^N - 1$.
Number of nonempty subsets of S = $2^{400} - 1$
The nonempty subsets of S which have the product of their elements equal to on odd number have each of their elements equal to an odd number. These subsets of S are subsets of {1, 3, 5, ...., 399}.
There are $2^{200} - 1$ non empty subsets of S which have the product of their elements equal to an odd number.
∴ The remaining $2^{400} - 1 - (2^{200} - 1)$ i.e. $2^{400} - 2^{200}$ non-empty subsets of S have the product of their elements equal to an even number.                                       Choice (C)

Q9.  DIRECTIONS *for questions 6 to 11:* Select the correct alternative from the given choices.
A line, L, passing through the points (1, 1) and (2, 0) meets the *y*-axis at A. The line passing through

the point $\left(\frac{1}{2}, 0\right)$ and perpendicular to L meets the *y*-axis at B and the line L at C. Find the area of

the triangle ABC.

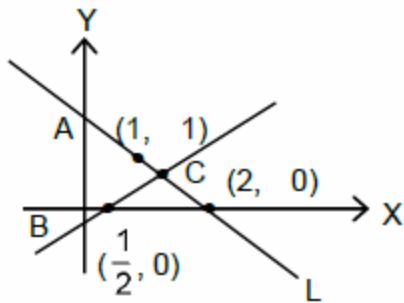a) $\dfrac{25}{16}$

b) $\dfrac{16}{9}$

c) $\dfrac{32}{19}$

d) $\dfrac{40}{23}$

Equation of the line L is

$$y - 1 = \frac{0-1}{2-1}(x-1)$$

i.e. $x + y = 2$ ..............(1)



equation of line through $(\frac{1}{2}, 0)$ and perpendicular to (1) is

$$y = -\frac{2-1}{0-1}\left(x - \frac{1}{2}\right)$$

i.e. $x - y = \frac{1}{2}$ - (2)

(2) intersects y axis at B $\left(0, -\frac{1}{2}\right)$ and at C $\left(\frac{5}{4}, \frac{3}{4}\right)$

∴ Area of triangle ABC = $\frac{1}{2}\left[\frac{5}{4}\right]\left[2 + \frac{1}{2}\right] = \frac{25}{16}$         Choice (A)


Q10.  DIRECTIONS *for questions 6 to 11:* Select the correct alternative from the given choices.
The cost of an eraser is one-twelfth of that of a pen and two-thirds of that of a pencil. If the cost of two pens is Rs.33 more than the cost of five pencils, then find the cost of one pen, two pencils and three erasers.


a) **Rs.30**

b) **Rs.36**

c) **Rs.48**

d) **Rs.33**

Let the cost of a pen be 24$k$
∴the cost of an eraser = 2$k$
∴the cost of a pencil = 3$k$
It is given that, 2(24$k$) – 5(3$k$) = 33$k$ = 33
∴$k$ = 1
∴ The cost of one pen, two pencils and three erasers
= 24$k$ + 2(3$k$) + 3(2$k$) = 36$k$ = ₹36                    Choice (B)

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Q11. DIRECTIONS *for questions 6 to 11:* Select the correct alternative from the given choices.

A rectangular sheet of paper was folded along the line joining the midpoints of its longer sides. The rectangle which resulted had the same ratio of its longer and shorter sides as that of the original rectangle. If the breadth of the original rectangle is $\sqrt{2}$ cm, find the area (in sq.cm) of the smaller rectangle.

a) $\dfrac{3\sqrt{2}}{4}$

b) $\sqrt{2}$

c) $\dfrac{3\sqrt{2}}{2}$

d) $4\sqrt{2}$

Let the length and the breadth of the original rectangle be l and b respectively.

$$\frac{l}{b} = \frac{b}{l/2}$$

2b² = l²

$\sqrt{2}b = l$

As b = $\sqrt{2}$, l = 2

Area of the smaller rectangle = $\dfrac{lb}{2} = \sqrt{2}$ sq.cm.                    Choice (B)

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Q12. DIRECTIONS *for question 12:* Type in your answer in the input box provided below the question.

Some friends planned to contribute equally to jointly buy a CD player. However, two of them decided to withdraw at the last minute. As a result, each of the others had to shell out one rupee more than what they had planned for. If the price (in Rs.) of the CD player is an integer between 1000 and 1100, find the number of friends who actually contributed.

Let the number of friends initially be $n$ and let the contribution of each be $x$.
Given $nx = (n - 2)(x + 1) = nx - 2x + n - 2$
$\Rightarrow n = 2(x + 1)$
We tabulate the possible values of $x$, $n$ and $nx$ below.

| $x$ | $n$ | $nx$ |
|---|---|---|
| 21 | 44 | 920 |
| 22 | 46 | 1012 |
| 23 | 48 | 1104 |
| 24 | 50 | 1200 |

As $1000 < nx < 1100$, $(x, n) = (22, 46)$ i.e. $n = 46$.
Hence, number of friends who actually contributed $= n - 2 = 44$      Ans: (44)

Q13. DIRECTIONS *for questions 13 and 14:* Select the correct alternative from the given choices.
If a copper wire of diameter 1.5 cm and length 80 m is melted completely and recast to form a solid spherical ball of radius R cm, then find the value of R (in cm).

a) **15**

b) **12**

c) **20**

d) **25**

Total volume of metal used in the copper wire

$= \pi(r)^2 \ell$ where $r = \left(\dfrac{1.5}{2}\right) = 0.75$ and $\ell = 8000$ cm

Volume of the spherical ball $= \dfrac{4}{3} \pi R^3$ cu.cm.

As, the ball is obtained by melting the wire, their volumes will be equal

$\because \dfrac{4}{3} \pi R^3 = \pi \left(\dfrac{3}{4}\right)^2 8000$

$\Rightarrow R^3 = \dfrac{3^3}{4^3} \times 8000 = \left(\dfrac{3}{4} \times 20\right)^3$

$\therefore R = \left(\dfrac{3}{4} \times 20\right) = 15$ cm                                   Choice (A)

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**Q14.** DIRECTIONS *for questions 13 and 14:* Select the correct alternative from the given choices. There are two variants of detergents – A and B. Detergent A contains 75% soap and 25% bleach, while detergent B contains 85% soap and 15% bleach. In what ratio should the detergents A and B be mixed, so that the resultant mixture contains 79% soap in it?

a) **2 : 3**

b) **3 : 4**

c) **5 : 4**

d) **3 : 2**

Let the quantities of the two detergents A and B mixed by *x* and *y* respectively

Using Alligation, we get

$$\therefore \frac{x}{y} = \frac{6}{4} = \frac{3}{2}$$

Choice (D)

Q15.   DIRECTIONS *for questions 15 to 17:* Type in your answer in the input box provided below the question.

Find the value of $\sin^2 A + \sin^2 B + \sin^2 C$, if A, B and C are the angles of a right angled triangle.

Of the three angles one is 90° and the other two are complementary
Say, $\angle A + \angle B = 90$ and $\angle C = 90$
Now, $\sin^2 A + \sin^2 B + \sin^2 C = \sin^2 A + \sin^2 (90 - B) + 1$
$= \sin^2 A + \cos^2 A + 1$
$= 1 + 1 = 2$

Ans: (2)

Q16.   DIRECTIONS *for questions 15 to 17:* Type in your answer in the input box provided below the question.

Two tanks, $T_1$ and $T_2$, of equal capacities, are provided with inlet taps, A and B, of different flow rates, respectively. Tap A begins to fill the first tank. Seven minutes later, tap B is opened. Nine minutes after that, the total quantity of water in the two tanks is just enough to fill one tank completely. Exactly *t* minutes after that both the tanks are full. What is the value of *t*?

Tap A is opened first but the two taps fill up their respective tanks at the same time. Therefore, the flow rate of B is greater, say k times the flow rate of A. (We can assume that the rate of A is 1 and that of B is k.)

From t = 0 to t = 16, A fills up a certain volume (say X).

From t = 7 to t = 16, B fills up V – X, where V is the volume of each tank

$$\therefore \frac{X}{V-X} = \frac{16}{9k} \quad .........(1)$$

From t = 16 to t = T(say), A fills up the remaining V – X in the first tank and B fills up the remaining X in the second tank.

$$\frac{V-X}{X} = \frac{1}{k} \quad ...........(2)$$

$$\therefore \frac{16}{9k^2} = 1 \Rightarrow k = \frac{4}{3} \text{ and } \frac{X}{V} = \frac{4}{7}$$

Consider A. To fill 4 units, it takes 16 minutes.

∴ To fill the remaining 3 units, it takes 12 minutes

(If we consider B, we expect to get the same result. To fill 3 units, it takes 9 minutes.

∴ To fill the remaining 4 units, it takes 12 minutes). 
Ans: (12)

Q17.  DIRECTIONS *for questions 15 to 17:* Type in your answer in the input box provided below the question.

The visibility on a certain road is limited to a distance of 80 m due to fog. A car travelling on that road crossed a cart moving in the same direction. If the speed of the cart and the car are 8 km/hr and 44 km/hr respectively, then for how long (in seconds) will the car be visible to the driver of the cart after it overtook the cart?

The relative speed of the car with respect to the cart
= 44 – 8 = 36 km/hr

$$= 36 \times \frac{5}{18} = 10 \text{ m/s. Now, the car would be visible to the driver of the cart till the car}$$

is 80m ahead of the cart.

Time for which the car is visible

$$= \frac{80}{10} = 8 \text{ seconds}$$
Ans: (8)

Q18.  DIRECTIONS *for question 18:* Select the correct alternative from the given choices.

Which of the following is true regarding a, b, c and d, if a = $2^{\frac{1}{3}}$, b = $3^{\frac{1}{4}}$, c = $4^{\frac{1}{5}}$ and d = $5^{\frac{1}{6}}$ ?

a) *c > a > d > b*

Let us compare $2^{\frac{1}{3}}$, $3^{\frac{1}{4}}$, and $5^{\frac{1}{6}}$
Raising all the number to the power of 12, we get.

$$\left(2^{\frac{1}{3}}\right)^{12} = 2^4 = 16, \quad \left(3^{\frac{1}{4}}\right)^{12} = 3^3 = 27 \quad \text{and} \quad \left(5^{\frac{1}{6}}\right)^{12} = 5^2 = 25.$$

As $27 > 25 > 16$, so $3^{1/4} > 5^{1/6} > 2^{1/3}$
Now, we compare $3^{1/4}$ and $4^{1/5}$.
Raising both to the power of 20, we get
$(3^{1/4})^{20} = 3^5 = 243$ and $(4^{1/5})^{20} = 4^4 = 256$.
As $256 > 243$, so $4^{1/5} > 3^{1/4}$
$\therefore c > b > d > a$                                    Choice (B)

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

In a triangle ABC, there are 5, 6 and 4 points, different from the vertices A, B and C of the triangle, on the three sides, AB, BC and CA respectively. How many distinct triangles can be drawn using the 18 points (including the vertices A, B and C)

The total number of points = 3 + (5 + 6 + 4) = 18
Of these 18 points A, B and 5 of the points on AB are collinear. B, C and 6 of the points on BC are collinear. A, C and 4 of the points on AC are collinear. Hence 7 points are collinear on AB, 8 points are collinear on BC and 6 points are collinear on AC. Hence total number of distinct triangles = $^{18}C_3 - (^7C_3 + {}^8C_3 + {}^6C_3)$
= 816 – (35 + 56 + 20)
= 816 – 111 = 705                                    Ans: (705)

Q20.   DIRECTIONS *for questions 20 and 21:* Select the correct alternative from the given choices.

If P and Q are two natural numbers, and an operation $\oplus$ is defined such that $P \oplus Q = \sqrt{\sqrt[3]{\frac{P}{Q}} + \sqrt[3]{\frac{Q}{P}}}$, which of the following is an integer?

a) **27 ⊕ 8**

b) **64 ⊕ 27**

c) **8 ⊕ 64**

d) **None of the above**

Evaluating the first three choices does not result in an integer. Hence choice (D) follows.                                   Choice (D)

Q21.   DIRECTIONS *for questions 20 and 21:* Select the correct alternative from the given choices.
If, in a class, the number of students who passed in at most 0, 1, 2, 3, 4 and 5 subjects is 3, 7, 9, 14, 15 and 22 respectively, find the number of students who passed in at least 3 subjects.

a) **8**

b) **13**

c) **14**

d) **15**

The number of students who passed in at most 0 subjects is 3 i.e., the number of students who passed in exactly 0 subjects is 3.
The number of students who passed in at most 1 subject is 7, i.e. the number of students who passed in exactly 1 subject is 7 – 3 or 4.
We can proceed along similar lines and work out the number of students who passed in exactly 2, 3, 4 and 5 subjects.
The data and calculations are tabulated below. The data appears in the second row.

|  | 0 | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|---|
| No. of students who passed in exactly | 3 | 4 | 2 | 5 | 1 | 7 |
| No. of students who passed in at most | 3 | 7 | 9 | 14 | 15 | 22 |
| No. of students who passed in at least | 22 | 19 | 15 | 13 | 8 | 7 |

Each number in the first row (except the first) is the corresponding number in the second row minus the number to its left.
Each number in the third row (except the last) is the sum of all the numbers on top and to the right in the first row.
∴ The number of students who passed in at least 3 subjects is 13.          Choice (B)

Q22.   DIRECTIONS *for question 22:* Type in your answer in the input box provided below the question.
The number of integer values of $x$ that satisfy the inequality $|x - 1| |x - 2| \le 10$ is

It can be observed that the two terms appearing within the modulus signs are two consecutive integers. It is very easy to answer this question using enumeration approach.

| $x$ | $x - 1$ | $x - 2$ | $|x - 1||x - 2| \le 10$ |
|---|---|---|---|
| −1 | −2 | −3 | 6 |
| 0 | −1 | −2 | 2 |
| 1 | 0 | −1 | 0 |
| 2 | 1 | 0 | 0 |
| 3 | 1 | 2 | 2 |
| 4 | 3 | 2 | 6 |

Hence, there are six such values.                                                    Ans : (6)

Q23.   DIRECTIONS *for questions 23 and 24:* Select the correct alternative from the given choices.

If the sum of two positive numbers $p$ and $q$ is 4, find the minimum possible value of the expression $\left(p + \frac{1}{p}\right)^2 + \left(q + \frac{1}{q}\right)^2$.

a) **36.25**

b) **14**

c) **12.5**

d) **4**

Let $E = (p + 1/p)^2 + (q + 1/q)^2$
$= (p^2 + q^2) + (p^2 + q^2 / p^2q^2) + 4$
As $p + q = 4$, $p^2 + 2pq + q^2 = 16$. As the max value of $2pq$ is 8, the min value of $p^2 + q^2$ is 8. The min value of $p^2 + q^2/p^2q^2$ is the min value of $p^2 + q^2$ divided by the max value of $p^2q^2$ (because $p^2 + q^2$ acquires its min value precisely when $p^2q^2$ acquires its max value), i.e., 8/16 or 0.5.
$\therefore E_{min} = 8 + 0.5 + 4 = 12.5$                                    Choice (C)

Q24.  DIRECTIONS *for questions 23 and 24:* Select the correct alternative from the given choices.
If a leap year is chosen at random, what is the probability that there are exactly 52 Sundays in it?

a) $\dfrac{1}{7}$

b) $\dfrac{2}{7}$

c) $\dfrac{5}{7}$

d) $\dfrac{6}{7}$

A leap year consists of 366 days

$366 = 7 (52) + 2$

i.e, each day occurs 52 times and only 2 of the seven days occur 53 times

Now, the two extra days can be as follows:

1. Sunday, Monday
2. Monday, Tuesday
3. Tuesday, Wednesday
4. Wednesday, Thursday
5. Thursday, Friday
6. Friday, Saturday
7. Saturday, Sunday

Therefore, the probability that a leap year consists of 52 Sundays will be all the above listed cases except the first and last one i.e., $\frac{5}{7}$            Choice (C)

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

If $(x - y)(x^2 + y^2) = 965$ and $(x + y)(x^2 - y^2) = 1805$, where $x$ and $y$ are positive integers, find the value of $xy$.

$(x - y)(x^2 + y^2) = 965 = 5(193)$
$(x + y)(x - y)(x + y) = 1805 = 5(19)(19)$
As $x$ and $y$ are positive integers, we get
$x + y = 19$ and
$x - y = 5$
solving, we get $x = 12$ and $y = 7$
$\therefore xy = 84$            Ans: (84)

Q26. DIRECTIONS *for questions 26 and 27:* Select the correct alternative from the given choices.
If the sum of the cubes of the sides of a triangle equals thrice the product of those sides, find the type of the triangle.

a) **Right angled**

b) **Isosceles**

c) **Equilateral**

d) **Cannot be determined**

Let the sides of the triangle be p, q and r
$p^3 + q^3 + r^3 = 3pqr$
$\Rightarrow p^3 + q^3 + r^3 - 3pqr = 0$
$\Rightarrow (p + q + r)(p^2 + q^2 + r^2 - pq - qr - rp) = 0$
$$\Rightarrow (p + q + r)\left(\frac{(p-q)^2 + (q-r)^2 + (r-p)^2}{2}\right) = 0$$
$\Rightarrow (p + q + r)((p - q)^2 + (q - r)^2 + (r - p)^2) = 0$
p, q, r > 0. ∴ p + q + r > 0.
∴ i.e. p + q + r ≠ 0
∴ $(p - q)^2 + (q - r)^2 + (r - p)^2 = 0$
This is possible only when p − q = q − r
= r − p = 0
i.e., when p = q = r, i.e., when the triangle is equilateral.                    Choice (C)

Q27.  DIRECTIONS *for questions 26 and 27:* Select the correct alternative from the given choices.
The number of parrots and mynas in an aviary is in the ratio of 5 : 8. If 21 birds of each type are added to the existing lot, then the ratio would change to 4 : 5. How many parrots and mynas are there in the aviary?

a) **26**

b) **39**

c) **52**

d) **65**

Let us denote the number of parrots and mynas by 5*k* and 8*k* respectively.
Now, $\dfrac{5k + 21}{8k + 21} = \dfrac{4}{5}$

$\Rightarrow 7k = 21$
∴ k = 3
The total number of parrots and mynas in the canary
= 13k = 13 (3) = 39                    Choice (B)

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

If the cube root of $45 + 29\sqrt{2}$ is $a + \sqrt{b}$ then find the value of $2a^3 + 3b^2$.

The cube of the surd $a + \sqrt{b}$ is $a^3 + 3ab + \sqrt{b}\ (3a + b)$

It is given that $a^3 + 3ab + \sqrt{b}\ (3a^2 + b) = 45 + 29\sqrt{2}$

Equating the rational and irrational parts, we get

$a^3 + 3ab = 45$ and $\sqrt{b}\ (3a^2 + b) = 29\sqrt{2}$

Taking $b = 2$, we get

$\sqrt{2}\ (3a^2 + 2) = 29\sqrt{2}$

$\Rightarrow a = \pm 3$

But, only for $a = 3$ and $b = 2$, we get $a^3 + 3ab = 45$.

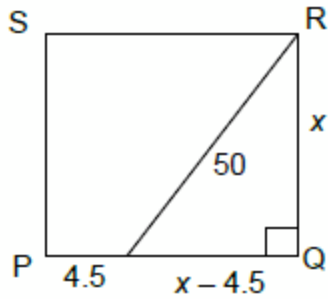Therefore the cube root of $45 + 29\sqrt{2}$ is $3 + \sqrt{2}$

$\Rightarrow 2a^3 + 3b^2 = (2 \times 27) + (3 \times 4)$

$= 54 + 12 = 66$ <span style="float:right">Ans: (66)</span>

Q29.   DIRECTIONS *for questions 29 to 34:* Select the correct alternative from the given choices.
There is a point A on the side PQ of a square PQRS. If PA = 4.5 inches and the area of the triangle
AQR is 50 sq.inches, what is the perimeter of the square PQRS?

a) **40 inches**

b) **45 inches**

c) **60 inches**

d) **50 inches**

Let the PQ = $x$



Given that area of $\triangle AQR = 50$

$\Rightarrow \frac{1}{2}(x-4.5)(x)=50$

$\Rightarrow x^2 - 4.5x - 100 = 0$

$\Rightarrow (x - 12.5)(x + 8) = 0$

$\Rightarrow x = 12.5$

$\therefore$ Perimeter $= 4x = 50$          Choice (D)

Q30.  DIRECTIONS *for questions 29 to 34:* Select the correct alternative from the given choices.

If $L = \frac{p+q}{p-q}$, $M = \frac{q+r}{q-r}$ and $N = \frac{r+p}{r-p}$, what is the value of LM + MN + NL?

a) –1

b) 0

c) 1

d) 2

Given that $\dfrac{L}{1} = \dfrac{p+q}{p-q}$, $\dfrac{M}{1} = \dfrac{q+r}{q-r}$, $\dfrac{N}{1} = \dfrac{r+p}{r-p}$,

Apply componendo and dividendo for the above equation,

$\dfrac{p}{q} = \dfrac{L+1}{L-1}$, $\dfrac{q}{r} = \dfrac{M+1}{M-1}$, $\dfrac{r}{p} = \dfrac{N+1}{N-1}$

$\dfrac{p}{q} \times \dfrac{q}{r} \times \dfrac{r}{p} = \dfrac{(L+1)(M+1)(N+1)}{(L-1)(M-1)(N-1)} = 1$

$\Rightarrow$ LM + MN + NL + 1 = – LM – MN – NL – 1

$\Rightarrow$ LM + MN + NL = –1

**Alternative solution:**

The question can be solved by directly assuming values for $p$, $q$ and $r$ as say –1, 0 and 1 (OR 1, 2 and 3) respectively.
The values of L, M and N will automatically follow, and LM + MN + NL can easily be verified to be –1.   Choice (A)

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Q31.  DIRECTIONS *for questions 29 to 34:* Select the correct alternative from the given choices.

The unit's digit of $723^{327}$ is

a) **1.**

b) **3.**

c) **7.**

d) **9.**

$723^{327} = (\underline{\hspace{1cm}} 3)^{4k+3} = (\underline{\hspace{1cm}} 3)^3 = \underline{\hspace{1cm}} 7.$
[$\because 3^{4k}$ ends in 1 and 327 = 4 (81) +3]   Choice (C)

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Q32.  DIRECTIONS *for questions 29 to 34:* Select the correct alternative from the given choices.
In a certain theatre, there are 300 seats. When the price of a ticket was Rs.60, the theatre ran to a full house. For every Rs.3 increase in the price of the ticket, the strength of the audience dropped by 10.The maximum possible revenue that the theatre owner will earn from the sale of tickets is

a) **Rs.18600.**

b) **Rs.19050.**

c) **Rs.18750.**

d) **Rs.19350.**

Given: Theatre capacity = 300
Let the price of the ticket be ₹ (60 + 3x)
For every ₹3 increase in the price of the ticket from ₹60, the strength of the audience drops by 10.
∴ The strength at the above price = 300 – 10x
Revenue at this price (in ₹)
= (60 + 3x)(300 – 10x) = 18000 + 300x – 30x²
= 18000 – 30 (x² – 10x)
= 18000 – 30 (x² – 10x + 25) + (30)(25)
= 18750 – 30 (x – 5)²
This is maximum i.e. when (x – 5)² = 0
∴ Maximum revenue = ₹18750                                             Choice (C)

Q33. DIRECTIONS *for questions 29 to 34:* Select the correct alternative from the given choices.

If $13^{\left(\log_x 872\right)} = 5^{\left(\log_{25} 961\right)} + 7^{\left(\log_{\sqrt{7}} 29\right)}$, then the value of *x* is

a) $\sqrt{13}$

b) $13\sqrt{3}$

c) **169·**

d) **13·**

$$5^{(\log_{25} 961)} = 5^{\left(\frac{1}{2}\log_5 961\right)} = 5^{\left(\log_5 961^{\frac{1}{2}}\right)}$$

$$= 5^{(\log_5 31)} = 31$$

$$7^{\left(\log_{\sqrt{7}} 29\right)} = 7^{(2\,og_7 29)} = 7^{\left(\log_7 29^2\right)}$$

$$= 29^2 = 841$$

$$\therefore 13^{\left(\log_x 872\right)} = 31 + 841 = 872$$
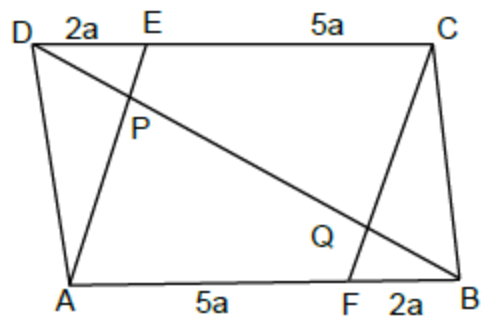
$$\therefore x = 13$$

Choice (D)

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Q34.  DIRECTIONS *for questions 29 to 34:* Select the correct alternative from the given choices.
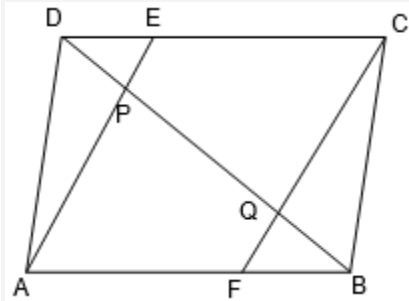


In the figure above, ABCD is a parallelogram, where DE : EC = BF : FA = 2 : 5. If BD = 18 cm, what is the length of PQ?

a) **8 cm**

b) **9 cm**

c) **10 cm**

d) **Cannot be determined**

As DE : EC = 2 : 5, it follows that DP : PQ = 2 : 5.
As AF : FB = 5 : 2, it follows that PQ : QB = 5 : 2.
∴ DP : PQ : QB = 2 : 5 : 2 or PQ : DB = 5 : 9
As DB is 18, PQ is 10.                                                    Choice (C)