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AIMCAT 2015
VARC

DIRECTIONS *for questions 1 to 5:* The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

Do world-class swimmers' hearts function differently than the hearts of elite runners? …Cardiologists and exercise scientists already know that regular exercise changes the look and workings of the human heart. The left ventricle […] receives oxygen-rich blood from the lungs and pumps it out to the rest of the body, using a rather strenuous twisting and unspooling motion, as if the ventricle were a sponge being wrung out before springing back into shape. Exercise requires that considerable oxygen be delivered to working muscles, placing high demands on the left ventricle. In response, it typically becomes larger and stronger in athletes than it is in sedentary people and functions more efficiently, filling with blood a little earlier and more fully and untwisting with each heartbeat a bit more rapidly, allowing the heart to pump more blood more quickly.

…[D]ifferent types of exercise often produce subtly different effects. A 2015 study found that competitive rowers, whose sport combines endurance and power, had greater muscle mass in their left ventricles than runners, making their hearts strong but potentially less nimble during the twisting that pumps blood to muscles. These past studies compared the cardiac effects of land-based activities. Few have examined swimming, even though it is not only a popular exercise but also a unique exercise. Swimmers, unlike runners, lie prone, in buoyant water and hold their breaths, all of which could affect cardiac demands and how the heart responds and remakes itself. So, for the new study, researchers set out to map the structure and function of elite swimmers' and runners' hearts. They focused on world-class performers because those athletes would have been running or

swimming strenuously for years, presumably exaggerating any differential effects of their training, the researchers reasoned.

Eventually they recruited 16 national-team runners and another 16 comparable swimmers, male and female, [and] asked the athletes to visit the exercise lab after not exercising for 12 hours and then, when on site, to lie quietly. They checked heart rates and blood pressures and finally examined the athletes' hearts with echocardiograms...

It turned out, that [all] the athletes enjoyed enviable heart health. Their heart rates hovered around 50 beats per minute, with the runners' rates slightly lower than the swimmers'. But all athletes' heart rates were much lower than is typical for sedentary people. The athletes also had relatively large, efficient left ventricles... But there were interesting, if small, differences between the swimmers and runners. While all athletes' left ventricles filled with blood earlier than average and untwisted more quickly during each heartbeat, those desirable changes were amplified in the runners...

…[T]hese differences do not necessarily show that the runners' hearts worked better than those of the swimmers... Since swimmers exercise in a horizontal position their hearts do not have to fight gravity to get blood back to the heart, unlike in upright runners. Posture does some of the work for swimmers, and so their hearts reshape themselves only as much as needed for the demands of their sport. The findings […] might provide a reason for swimmers sometimes to consider logging miles on the road to intensify the remodelling of their hearts. Of course, the athletes here were tested while resting, not competing, and it is not clear whether any variations in their ventricles would be meaningful during races… Also, athletes might have been born with unusual cardiac structures that somehow allowed them to excel at their sports, instead of the sports changing their hearts.

Q1. Which of the following is not an inference that can be drawn from the passage?

a) A lower heartbeat rate is an indicator of a healthy heart.

b) Greater muscle mass in the heart reduces its agility.

c) The heart functions differently while resting and during strenuous physical activity.

d) The heart functions most efficiently when athletes indulge in both running and swimm

Q2. The remodelling of the heart is different in swimming than in the case of running because

a) the latter needs the heart to do more work than the former.

b) the latter is a land-based activity whereas the former is a water-based activity.

c) the former is a more strenuous activity than the latter as the former involves fighting gravity.

d) the former needs the heart to pump less oxygen to the muscles than the latter.

Q3. Which of the following studies will the author approve of in order to widen the scope of the arguments in the passage?

a) A study of heartbeat rates in a sedentary person involved in strenuous physical activity

b) A study of heartbeat rates in an athlete immediately after the act of swimming or running

c) A study of the differences in cardiac structures of athletes and those of non-athletes

d) A study of the differences between cardiac structures of athletes after years of professional training and the same before they had started training

Q4. World-class performers were selected for the study comparing the heart rates and blood pressure of athletes because

a) years of putting their hearts under duress will amplify any changes caused by physical training like swimming and running.

b) the results will be more pronounced in athletes who haven't exercised for 12 hours.

c) such athletes will have hearts which are healthy and robust, and ideal for the study.

d) years of training would have accelerated the remodelling of their cardiac structures.

Q5. The author mentions the 2015 study about competitive rowers to elucidate that

a) sports that need both endurance and power demand more from the heart than other sports.

b) the cardiac structure of the heart is affected differently by training in different sports.

c) the effects of different sports on the heart are only subtly different from one another.

d) the greater the muscle mass of the left ventricles, the less nimble they are during the twisting that pumps blood.

DIRECTIONS *for questions 6 to 9:* The passage given below is accompanied by a set of four questions. Choose the best answer to each question.

The Bengal famine of 1943 was the only one in modern Indian history not to occur as a result of serious drought, according to a study that provides scientific backing for arguments that Churchill-era British policies were a significant factor contributing to the catastrophe.

Researchers in India and the US used weather data to simulate the amount of moisture in the soil during six major famines in the subcontinent between 1873 and 1943. Soil moisture deficits, brought about by poor rainfall and high temperatures, are a key indicator of drought.

Five of the famines were correlated with significant soil moisture deficits. An 11% deficit measured across much of north India in 1896-97, for example, coincided with food shortages across the country that killed an estimated 5 million people.

However, the 1943 famine in Bengal, which killed up to 3 million people, was different, according to the researchers. Though the eastern Indian region was affected by drought for much of the 1940s, conditions were the worst in 1941, years before the most extreme stage of the famine, when newspapers began to publish images of the dying on the streets of Kolkata, then named Calcutta, against the wishes of the colonial British administration. In late 1943, thought to be the peak of the famine, rain levels were above average, said the study published in February in the journal Geophysical Research Letters…

Food supplies to Bengal were reduced in the years preceding 1943 by natural disasters, outbreaks of infections in crops and the fall of Burma – now Myanmar – which was a major source of rice imports, into Japanese hands.

But the Nobel prize-winning economist Amartya Sen argued in 1981 that there should still have been enough supplies to feed the region, and that the mass deaths in 1943 came about as a combination of wartime inflation, speculative buying and panic hoarding, which together pushed the price of food out of the reach of impoverished Bengalis. More recent studies, including those by the journalist Madhushree Mukerjee, have argued that the famine was exacerbated by the decisions of Winston Churchill's wartime cabinet in London. Mukerjee has presented evidence the cabinet was warned repeatedly that the exhaustive use of Indian resources for the war effort could result in famine, but it opted to continue exporting rice from India to elsewhere in the empire.

Rice stocks continued to leave India even as London was denying urgent requests from India's viceroy for more than one million tonnes of emergency wheat supplies in 1942-43. Churchill has been quoted as blaming the famine on the fact that Indians were "breeding like rabbits", and asking how, if the shortages were so bad, Mahatma Gandhi was still alive. Mukerjee and others also point to Britain's "denial policy" in the region, in which huge supplies of rice and thousands of boats were confiscated from coastal areas of Bengal in order to deny resources to the Japanese army in case of a future invasion…

Though India's population has vastly increased since the British colonial era, the country has largely eliminated famine deaths owing to more efficient irrigation practices, improvements in seed yields, a

stronger food distribution and welfare system and better transport links, which allow emergency food stocks to be moved quickly to deprived areas.

Q6. In the passage, the author is trying to establish that

a) the culpability for the Bengal famine lies squarely with Winston Churchill.

b) the fall of Burma led to shortage of rice supplies which in turn led to the famine.

c) the Bengal famine is by and large a man-made problem.

d) Britain's 'denial policy' in the region triggered the famine.

Q7. It can be inferred from the last para of the passage that:

a) high rate of population increase is a cause for famine deaths.

b) inefficient food circulation may lead to famine deaths.

c) lowering water wastage can lower the risk of famines.

d) part of the problem during the British era was the seed yield.

Q8. Which of the following, if true, will least weaken Amartya Sen's argument mentioned in the passage?

a) Deaths were equally distributed amongst all economic sections of society.

b) Food prices after 1943 became lower than they were in 1943 because of the lives claimed by the famine.

c) Food prices increased only because there weren't enough supplies to feed the region.

d) Food prices in 1943 were lower than they were in the next two years.

Q9. The ‘scientific backing’ referred to in the first para of the passage can be inferred to be:

a) data proving that five of the six major famines between 1873 and 1943 were related to significant soil moisture deficits.

b) the evidence that soil moisture deficits brought about by poor rainfall and high temperatures are a key indicator of drought.

c) the data that the eastern Indian region was affected by drought for much of the 1940s.

d) the evidence that the worst of the drought conditions didn't overlap with the Bengal famine of 1943.

DIRECTIONS *for questions 10 to 14:* The passage given below is accompanied by a set of five questions. Choose the best answer to each question.

We're living in an age of radicalism. But today's radicalism is unusual. First, we have radical anger without radical policies…The left-wing radicals talk a lot against the systems of oppression and an institutionalized injustice. But they are nothing like the radicals of the 1930s or the 1960s.

Today's radicals do not want to upend the meritocracy, which is creating a caste system of inherited inequality. They don't want to stop technical innovation, which is displacing millions of workers. They don't have plans to reverse individualism, which atomizes society and destroys community.

Second, today's radicalism is more about identity than social problems...Consider the angry commentary you hear during a given day. How much of it is addressing a problem we face, and how much of it is denouncing people we dislike?

Third, today's radicalism assumes that war is the inherent state of things. The key influence here is Saul Alinsky… One of his first big assertions is that life is warfare. It is inevitably a battle between the people and the elites, the haves and the have-nots, or, as his heirs would add, between the whites and the blacks, the Republicans and the Democrats, Islam and the West...

Fourth, there is the low view of human nature. Today's radicals conduct themselves on the presumption that since life is battle, moral decency is mostly a hypocritical fraud. To get anything done the radical has to commit evil acts for good causes. "The ethics of means and ends is that in war the end justifies almost any means," Alinsky writes. "Ethical standards must be elastic to stretch with the times," he adds [in his book Rules for Radicals]. "Ethics are determined by whether one is losing or winning."

What can we conclude about the radicals? Well, they are wrong that our institutions are fundamentally corrupt. Most of our actual social and economic problems are the bad by-products of fundamentally good trends. Technological innovation has created wonders but displaced millions of workers. The meritocracy has unleashed talent but widened inequality. Immigration has made America more dynamic but weakened national cohesion. Globalization has lifted billions out of poverty but pummelled the working classes in advanced nations.

What's needed is reform of our core institutions to address the bad by-products, not fundamental dismantling. That sort of renewal means doing the opposite of everything the left/right radicals do. It means believing that life can be more like a conversation than a war if you open by starting a conversation. It means collectively focusing on problems and not divisively destroying people. It

means believing that love is a genuine force in human affairs and that you can be effective by appealing to the better angels of human nature.

Today's radicalism is fundamentally spiritual, even if it's played out in the political sphere. It's driven by the radicals' need for more secure identity, to gain respect and dignity, to give life a sense of purpose and meaning.

The radicals are looking for meaning and purpose in the wrong way and in the wrong place, and they're destroying our political world in the process. But you've got to give them one thing: They are way ahead of the rest of us. They are organized, self-confident, aggressive and driving history. The rest of us are dispersed, confused and in retreat.

Q10. The author attributes the rise of today's radicalism to:

a) fundamental dismantling of institutions.

b) a focus on individual identity.

c) technological innovation.

d) the self-confidence and aggression of radicals.

Q11. All of the following would find resonance with the author’s ideas in the passage EXCEPT that:

a) our institutions are governed by sound fundamentals.

b) radicals don’t have to commit evil acts to promote good causes.

c) social and economic problems are by-products of fundamentally corrupt institutions.

d) ethical standards need not be flexible to suit the times.

Q12. The author’s suggestion to ameliorate the present situation is to:

a) return to spirituality.

b) give the radicals a sense of dignity.

c) address the problems cohesively.

d) dismantle the core institutions.

Q13. Which of the following has not been mentioned by the author about today's radicalism to explain why it is unlike radicalism in the bygone era?

a) It is more about active censure than finding solutions.

b) An identity crisis takes priority over relevant issues in society.

c) The bar is quite low for humanity and its values.

d) It encourages meritocracy and creates inequality.

Q14. Which of the following cannot be inferred from the passage?

a) Radicals are more organised when it comes to building communities.

b) Radicals are more focused on claiming their own place in society than in fixing society itself.

c) Technological innovation, meritocracy, and immigration are not fundamentally flawed concepts.

d) Constructive dialogue, and not brash aggression, defines those who do not subscribe to radicalism.

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

For language lovers, the facts are grim: Anglophones simply aren't learning them anymore. In Britain, despite four decades in the European Union, the number of A-levels taken in French and German has fallen by half in the past 20 years, while what was a growing trend of Spanish-learning has stalled...

Why learn a foreign language? After all, the one you already speak […] is the world's most useful and most important language. English is not just the first language of the obvious countries; it is now the rest of the world's second language...Nonetheless, compelling reasons remain for learning other languages…First, learning any foreign language helps you understand all languages better... Second, there is the cultural broadening. Literature is always best read in the original. Poetry and lyrics suffer particularly badly in translation. And learning another tongue helps the student grasp

another way of thinking. Though the notion that speakers of different languages think differently has been vastly exaggerated and misunderstood, there is a great deal to be learned from discovering what the different cultures call this [or] that …

The practical reasons are just as compelling. In business, if the team on the other side of the table knows your language but you don't know theirs, they almost certainly know more about you and your company than you do about them and theirs — a bad position to negotiate from. Many investors in China have made fatally stupid decisions about companies they could not understand... Virtually any career, public or private, is given a boost with knowledge of a foreign language.

So, which one should you learn? [A]n answer seems to leap out: Mandarin. China's economy continues to grow at a pace that will make it bigger than America's within two decades at most. China's political clout is growing accordingly. Its businessmen are buying up everything from American brands to African minerals to Russian oil rights. If China is the country of the future, is Chinese the language of the future?

Probably not. Remember Japan's rise? Just as spectacular as China's, if on a smaller scale, Japan's economic growth led many to think it would take over the world. It was the world's second-largest economy for decades... So, is Japanese the world's third-most useful language? Not even close ... And the key reason for Japanese's limited spread will also put the brakes on Chinese.

This factor is the Chinese writing system (which Japan borrowed and adapted centuries ago). The learner needs to know at least 3,000-4,000 characters to make sense of written Chinese, and thousands more to have a real feel for it. Chinese, with all its tones, is hard enough to speak. But the mammoth feat of memory required to be literate in Mandarin is harder still...Fewer and fewer native speakers learn to produce characters in traditional calligraphy…

… If I was asked what foreign language is the most useful, […] my answer would be French… As their empire spun off and they became a medium-sized power after the Second World War, the French […] established La Francophonie. This club, bringing together all the countries with a French-speaking heritage, has 56 members, almost a third of the world's countries…[French] can enhance your enjoyment of art, history, literature and food, while giving you an important tool in business and a useful one in diplomacy. It has native speakers in every region on earth and attracts more tourists than any other country…

Q15. Which of the following does the author not imply through his argument in favour of learning new languages?

a) The first language of a person is connected to the way of thinking of the person.

b) Insights can be gained by understanding words used in various cultures for known things.

c) Bilingualism and multilingualism may enhance the job prospects of an individual.

d) Business negotiations are hampered when one party doesn't understand the language of the other party.

Q16. The author is predisposed towards French as the foreign language to learn, NOT because:

a) it has a positive impact on the quality of one's lifestyle.

b) it pays dividends to know the language of the most popular tourist destination in the world.

c) it helps one understand the heritage of a third of the world's countries, which speak French.

d) French would be expedient for international business.

Q17. The author provides the example of Japan to explain that

a) the popularity of a country’s language doesn’t necessarily stem from the size of its economy.

b) the speed of economic growth of a country boosts the popularity of its language.

c) Chinese like Japanese is a tough language to learn and adopt.

d) the Chinese writing system is detrimental to Mandarin’s popularity.

Q18. All of the following are impediments to the popularity of Mandarin EXCEPT that:

a) the number of native speakers learning to produce Chinese calligraphy is dwindling

b) there are thousands of characters one needs to know to comprehend the language.

c) the language demands a lot out of one’s memory.

d) the tones in Chinese make it a tough language to speak.

Q19. The author is least likely to agree with which of the following?

a) A country's economic heft and political clout do not guarantee the popularity of its language.

b) The ease with which a language can be learnt is a contributing factor toward its popularity.

c) A language's role as a diplomatic and business tool is enhanced by the number of countries where it is spoken.

d) The impact of language on thinking is overrated.

Number of words and Explanatory notes for RC:

Number of words: 569

Option A: The author clearly explains why neither Japanese, during Japan's meteoric rise, nor Chinese, now, could be languages of the future, because of their difficulty. So, it can be understood that economic heft and political clout of a nation don't guarantee the popularity of its language. Option A is not the answer, as the author will agree with the statement.
Option B: Given that the author establishes the difficulty of Mandarin as a major roadblock to Chinese becoming popular, it can be inferred that the author will agree with the statement, that the ease of a language contributes to its popularity. Hence, Option B is not the answer.
Option C: The author mentions the example of French as the best foreign language to learn. One of the reasons the author mentions to support the cause of French is that it is spoken by almost a third of the world's countries, moving on to assert that French helps one in enjoyment of arts and cuisines while offering a diplomatic tool. However, the author doesn't establish direct causation in '…[French] can enhance your enjoyment of art, history, literature and food, while giving you an important tool in business and a useful one in diplomacy'. So, Option C is the statement the author is least likely to accept, given that the number of countries which speak a language and the diplomacy advantage of such a language haven't been connected. So, while popularity of a languages for learning is affected by the number of countries where it is spoken, the role in diplomacy is not necessarily connected to the member.
Option D: This can be directly understood from '*Though the notion that speakers of different languages think differently has been* ***vastly exaggerated*** *and misunderstood…'* From this it can be understood that the author doesn't think there is a massive difference in thinking influenced by the tongue one speaks, although language is an indicator of one's thought processes to a certain extent. Option D is not the answer. Choice (C)

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

Humanity's power to control the four-letter code of life has advanced by leaps and bounds. A new gene-editing technology called CRISPR/Cas9 has been the subject of particular excitement.

CRISPRs are elements of an ancient system that protects bacteria from viruses. Bacteria capture DNA snippets from invading viruses and use them to create DNA segments (CRISPR arrays) which allow bacteria to 'remember' the viruses. If the viruses attack again, the bacteria produce RNA segments from the CRISPR arrays to target the viruses' DNA, cutting it apart using the Cas9 enzyme. CRISPRs have evolved over millions of years to trim pieces of genetic information from one genome and insert it into another.

This bacterial antiviral defense can be used to quickly edit the DNA of any organism in the lab. Researchers create a small piece of RNA with a short "guide" sequence that attaches (binds) to a specific target sequence of DNA in a genome. The RNA also binds to the Cas9 enzyme which cuts the DNA at the targeted location, allowing for the removal of unwanted sequences or inserting foreign sequences.

Whether scientists should use CRISPR/Cas9's power to create gene-edited babies is a matter of heated debate. Many people are worried that CRISPR/Cas9 could lead to new classes of genetically enhanced people and discrimination against others born with uncorrected genetic diseases. There are always ethical concerns when genome editing, using technologies such as CRISPR/Cas9, is used to alter human genomes for imparting beneficial traits such as height or intelligence.

On November 26th 2018, CRISPR has caused more unease than optimism. Dr He Jiankui [expert in DNA sequencing at the Southern University of Science and Technology, in Shenzhen] announced that he had edited the genomes of human embryos using CRISPR technology to remove the *CCR5* gene (that enables HIV virus to infect cells), and that twin girls, named Lulu and Nana, had been born through in vitro fertilization (assisted reproduction that involved sperm from an HIV positive male and eggs from female donors). .... But Dr He might have inadvertently caused mutations in other parts of the genome, which could have unpredictable health consequences. (He claims to have found no such mutations.) Also, *CCR5* is thought to help people fight off the effects of various other infections, such as that caused by the West Nile virus. If the gene is disabled, the girls could be vulnerable. ... Dr He's work appears to have had the scantiest oversight and violates regulations.

But Dr He claimed that he addressed this concern by sequencing the entire genomes of two cells from each embryo. This showed that both *CCR5* copies were disabled in one twin, but only one in the other. The parents were fully aware of that, and decided to implant both embryos anyway. After the implantation, he twice sequenced fetal DNA that had leaked into the mother's blood, and also DNA from umbilical-cord blood, a fetal tissue. When the babies were born, he also sequenced cells from various tissues. He concluded, as a result, that there might be one potential off-target mutation, that no mutation existed in the 609 cancer-associated genes he tested and that no large chunks of DNA were missing. How accurate his sequencing was and whether it covered the entire [human] genome are matters of conjecture. ...

In a nutshell, we don't know the limits of new technologies (superior genomes!), can't guess what lifetime effects a single gene alteration will have on a single individual, and have no idea what effects alteration of genes in sperm or ova or a fetus will have on future generations. For these reasons, we have no knowledge of whether a particular modification of the human germline will be ultimately catastrophic, and no basis for considering that tampering with heritable genes can be humane or ethical. Dr Zhai Xiaomei, the executive director of the Centre for Bioethics, China, warns that China might become a fertile ground for scandals if its regulatory capacity is not greatly strengthened. As George Church, a geneticist at Harvard University, says: _____

Q20. All of the following are true of the CRISPR/Cas9 system discussed in the passage EXCEPT?

a) CRISPR is a bacterial anti-viral system turned into a powerful gene-editing tool.

b) CRISPRs work by using an RNA sequence that homes in on a specified location in a strand of the target DNA.

c) An application of the CRISPR/Cas9 technology involves making changes to the target DNA by replacing an existing segment with a different DNA sequence.

d) It is not possible to genetically alter one's athletic power, intellectual ability or other characteristics using the CRISPR/Cas9 technology.

Number of words and Explanatory notes for RC:

Number of words: 665

Option A: CRISPRs are elements of an ancient system that protects bacteria from viruses. Bacteria capture DNA snippets from invading viruses and use them to create DNA segments (CRISPR arrays) which allow bacteria to 'remember' the viruses. If the viruses attack again, the bacteria produce RNA segments from the CRISPR arrays to target the viruses' DNA, cutting it apart using the Cas9 enzyme. CRISPRs have evolved over millions of years to trim pieces of genetic information from one genome and insert it into another. ***This bacterial antiviral defense can be used to quickly edit the DNA of any organism in the lab.*** Option A is true and is not an exception.
Option B: If the viruses attack again, the bacteria produce RNA segments from the CRISPR arrays to target the viruses' DNA, cutting it apart using the Cas9 enzyme. ... In the lab, researchers create a small piece of RNA with a short "guide" sequence that attaches (binds) to a specific target sequence of DNA in a genome. The RNA also binds to the Cas9 enzyme which cuts the DNA at the targeted location. Option B is correct and is not the answer.
Option C: In the lab, researchers create a small piece of RNA with a short "guide" sequence that attaches (binds) to a specific target sequence of DNA in a genome. The RNA also binds to the Cas9 enzyme which cuts the DNA at the targeted location, ***allowing for the removal of unwanted sequences or inserting foreign sequences.*** Option C is true and is not an exception.
Option D: There are always ethical concerns when genome editing, using technologies such as CRISPR/Cas9, is used to alter human genomes for imparting beneficial traits such as height or intelligence. Dr He has gone ahead in this direction with his experimentation when he removed the CCR5 gene from the human embryo(s). The passage does not throw sufficient light on whether the technology can/can't be currently used to genetically alter one's children's athletic power, intellectual ability or other characteristics. The passage only says that is unethical (a matter of heated debate) to use CRISPR-Cas9's power to create gene-edited babies. Option D is not correct and is the answer. Choice (D)

Q21. Which of the following is the primary concern of the author in this passage?

a) To explain a recent scientific development and predict its eventual consequences

b) To outline several reasons for a trend and recommend measures to address it

c) To highlight potential concerns of implementing a certain research technique

d) To present the results of a scientific methodology and propose further studies to enhance the future of humanity

Number of words and Explanatory notes for RC:

Number of words: 665

Option A: The passage does explain the findings of research conducted in the area of CRISPR/Cas9 technology. He recommends ways to curb that development (... We have no knowledge of whether a particular modification of the human germline will be ultimately catastrophic, and no basis for considering that tampering with heritable genes can be humane or ethical). The author does not predict the consequences if the situation is left unchanged or the recommendations unmet. Hence option A is not the answer.
Option B: The passage only cites scientific research involving the CRISPR/Cas9 technology and talks about the most recent development – the editing of the genomes of two babies. The passage does not revolve around the reasons for this development, neither does it recommend measures to address this development. The passage highlights the ethical concerns that arise because of tampering with human genomes. Option B is not the answer.
Option C: The passage explains the CRISPR/Cas9 approach to genome editing and the ethical concerns in genetic modification as far as its application to human genomes is concerned. Hence option C is the correct answer.
Option D: The first part of choice D is partly true but no further studies are proposed. The passage does not examine how CRISPR/Cas9 may affect the future of humanity. Hence option D is not the correct answer. Choice (C)

Q22. All of the following views or findings can be anticipated as possible objections to the claim of Dr He Jiankui in the passage EXCEPT:

a) Scientists do not fully understand the scope of the unintended damage CRISPR does to DNA elsewhere in the genome.

b) The deactivation of the CCR5 gene might leave one vulnerable to other diseases.

c) The DNA sequencing that Dr He Jiankui did covered only about 80% of the genome, leaving a lot of scope for error.

d) People without a working version of the CCR5 gene are immune to HIV infection.

Number of words and Explanatory notes for RC:

Number of words: 665

Dr He claimed to have edited the genomes of two babies. His work appears to have had the scantiest oversight and **violates regulations**. But Dr He claimed that he addressed this concern by sequencing the entire genomes of two cells from each embryo.

Option A: But Dr He might have inadvertently caused mutations in other parts of the genome, which could have unpredictable health consequences. (He claims to have found no such mutations.) Option A would undermine the claim of Dr He Jiankui in the passage and is not the answer.

Option B: But Dr He claimed that he addressed this concern by sequencing the entire genomes of two cells from each embryo. This showed that both *CCR5* copies were disabled in one twin, but only one in the other. The parents were fully aware of that, and decided to implant both embryos anyway. ... *CCR5* is thought to help people fight off the effects of various other infections, such as West Nile virus. If the gene is disabled, the girls could be vulnerable. If option B is true, then it would negate the claim of Dr He Jiankui in the passage. So option B is not the answer.

Option C: After the implantation, he twice sequenced fetal DNA that had leaked into the mother's blood, and also DNA from umbilical-cord blood, a fetal tissue. When the babies were born, he also sequenced cells from various tissues. He concluded, as a result, that there might be one potential off-target mutation, that no mutation existed in the 609 cancer-associated genes he tested and that no large chunks of DNA were missing. Option C also would undermine the claim of Dr He Jiankui in the passage and would serve to strengthen the view "How accurate his sequencing was and whether it covered the entire [human] genome are matters of conjecture." Hence option C is not the answer.

Option D: Dr He Jiankui [expert in DNA sequencing at the Southern University of Science and Technology, in Shenzhen] announced that he had edited the genomes of human embryos using CRISPR technology to remove the *CCR5* gene (that enables HIV virus to infect cells), and that twin girls, named Lulu and Nana, had been born through in vitro fertilization. So choice D forms the underlying basis of Dr He Jiankui's experiments. Option D does not serve as an objection to the claim of Dr He Jiankui in the passage. Hence the correct answer is option D. Choice (D)

Q23. Which of the following can serve as the most suitable title to this passage?

a) How will gene editing technologies reshape humanity?

b) Are we ready for enhanced genomes of individuals calibrated to our choice?

c) Is the CRISPR baby controversy the start of a terrifying new chapter in gene editing?

d) Using CRISPR for altering genomes: Should we or shouldn't we?

Number of words and Explanatory notes for RC:

Number of words: 665

Option A: The passage does not try to examine how CRISPR/Cas9 may affect the future of humanity. Option A does not specifically mention CRISPR/Cas9 and is incorrect as a title for the passage.
Option B: The passage focuses on explaining the new technology and its impact. Only its conclusion is about our readiness for enhanced genomes. The entire passage is not focusing on evaluating whether we are ready for enhanced genomes.
Option C: "start of a terrifying new chapter in gene editing" sounds scary and extreme. There are ethical concerns raised by the CRISPR/Cas9 methodology discussed in the passage. But option C isolates the CRISPR/Cas9 Baby research as a one-off case in a series of potentially negative case studies. Option C cannot be understood to be an umbrella view supported by the passage. Hence it cannot serve as an apt title to the passage.
Option D: There are always ethical concerns when genome editing, using technologies such as CRISPR/Cas9, is used to alter human genomes for imparting beneficial traits such as height or intelligence. CRISPR has caused more unease than optimism. Dr He Jiankui [expert in DNA sequencing at the Southern University of Science and Technology, in Shenzhen] announced that he had edited the genomes of human embryos using CRISPR technology to remove the *CCR5* gene ... The last para highlights the uncertainty of the research conducted by Dr He. ..We don't know the limits of new technologies (superior genomes!), can't guess what lifetime effects a single gene alteration will have on a single individual, and have no idea what effects alteration of genes in sperm or ova or a fetus will have on future generations. China might become a fertile ground for scandals if its regulatory capacity is not greatly strengthened. Hence option D can serve as the most suitable title to this passage.

Choice (D)

Q24. Which of the following can serve as the most apt comment of the geneticist George Church so as to complete the blank provided at the end of the last paragraph?

a) Can we use this newfound superpower technology in a useful way that will benefit the planet and its people – or will this be a race for scientific glory and profit or doom?

b) The genie is already out of the bottle, it needs to be put back and better oversight of places such as fertility clinics, where back-room genome-tinkerers may lurk, is necessary.

c) Since the risks to unborn children from genetic engineering mistakes are not currently known, and are likely substantial, few researchers support the no-regulation view with regards to modifying the human genome.

d) The reality is that we have crossed the rubicon: humans are on the verge of finally being able to modify their own evolution.

Number of words and Explanatory notes for RC:

Number of words: 665

Option A: The passage aims to explore the uses of the CRISPR-Cas9 technology, and the ethical concerns that may arise from its use. Option A jumps the gun. It needs a precedent and more substantiation. It can serve as the last sentence of a much larger extract which has gone to explore a cost-benefit analysis of the said technology in detail. Option A does not connect with the idea in the penultimate sentence of the last paragraph and cannot complete the blank.
Option B: The penultimate sentence of the last paragraph has a caveat: China might become a fertile ground for scandals if its regulatory capacity is not greatly strengthened. The last para (along with several other parts of the passage) highlights ethical concerns when genome editing, using technologies such as CRISPR/Cas9, is used to alter human genomes. The last sentence of the fifth para mentions that Dr He's work appears to have had the scantiest oversight and violates regulations. So option B which acts on a note of caution and which provides a suitable course of action can serve in completing the last sentence of the passage. Here "back-room genome-tinkerers" exemplifies Dr. He Jiankui.
Option C: While option C may be true, it cannot serve as a fitting concluding sentence to the last paragraph. The 'no-regulation view' finds no mention in the passage. The passage only talks about the need for regulation. Option C would need a precedent and more substantiation. Option C also sounds like a starting line of another paragraph.
Option D: "To cross the Rubicon" is a metaphor which means to take an irrevocable/ irreversible step that commits one to a specific course. Option D is too positive to fit in with the near negative tone of the last paragraph which highlights a lot of ethical concerns. Choice (B)

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

1. However, the origin of the April Fish in France is quite obscure.
2. That tradition dates to 1564.
3. Maybe it was reminiscent of the ichthus used by Christians in the Roman era.
4. In France, April Fools' Day is known for the "poisson d'avril".

5. People play an April Fools trick by sticking a paper fish onto the back of as many adults as possible and then run away yelling “Poisson d’Avril!” (April Fish!)

Sentence 1: Sentence 1 mentions 'origin of April Fish'.
Sentence 2: Sentence 2 has a reference to the demonstrative adjective 'that tradition'.
Sentence 3: Sentence 3 has a reference to the pronoun 'it'.
Sentence 4: Sentence 4 has the name of the location (France). It has a reference to “April Fools' Day”. April Fish has been introduced here. This sentence can serve as an introduction sentence to the para.
Sentence 5: Sentence 5 substantiates the point made in sentence 4 and explains the details of 'April Fish'.
Between sentences 1 and 4, 4 is a better starting sentence. Sentence 1 just mentions 'April Fish in France'. Sentence 4 mentions the French name for April Fish “poisson d’avril” and its connection to April Fools' Day. Sentence 4 is followed by sentence 5. “April Fools trick” in sentence 5 points to “April Fools’ Day” in sentence 4. “sticking a paper fish onto the back of as many adults as possible and then run away yelling “Poisson d’Avril!” (April Fish!)” in sentence 5 substantiates or further explains “known for the “poisson d’avril”” in sentence 4.
Sentence 5 is followed by sentence 2. “That tradition” in sentence 2 points to “sticking a paper fish ..... ““Poisson d’Avril!” (April Fish!)” mentioned in sentence 5. So sentences 5 and 2 form a logical block.
Sentences 1 and 3 form another logical block. “the origin of April Fish is obscure” in sentence 1 links with “maybe it was reminiscent of the ichtus” given in sentence 3. Sentence 2 is followed by sentence 1 which in turn is followed by sentence 3. So, 45213. Ans: (45213)

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

1. But there has been scant evidence of a smell associated with neurodegenerative disorders.
2. Although scent is not used nearly as often in modern medicine, it still has its place.
3. Hippocrates, Galen, Avicenna and other ancient physicians frequently used odour as a diagnostic tool.
4. Paramedics are taught to spot the fruity smell on the breath of hyperglycaemic diabetics and gastroenterologists are trained to detect the odour of digested blood.
5. Now, one has been found for Parkinson’s disease.

Sentence 1: Sentence 1 has a reference to the contrast conjunction 'but' and it mentions "neurodegenerative disorders".
Sentence 2: Sentence 2 has the contrast conjunction 'although'. It also has the clue "not nearly used as often" and "still has its place".
Sentence 3: Sentence 3 mentions the names of ancient physicians. It also provides the background: used odour as a diagnostic tool. Note that this sentence mentions 'ancient' which contrasts 'modern' in sentence 2.
Sentence 4: Sentence 4 mentions the use of odour as a diagnostic tool (in modern times).
Sentence 5: Sentence 5 has the time reference 'now'. It mentions a disease 'Parkinson's disease' (which is a *neurodegenerative disorder)*.
Sentence 3 is the best sentence to begin the paragraph. It establishes the background: ancient physicians frequently used odour as a diagnostic tool. Sentence 2 follows sentence 3. "scent is not used nearly as often in **modern** medicine" in sentence 2 contrasts "**ancient** physicians frequently used odour as a diagnostic tool" in sentence 3. So sentences 3 and 2 form a logical block.
Sentences 2 and 4 form another logical block. "scent still has its place" in sentence 2 links with "Paramedics are taught to spot the fruity smell ....and gastroenterologists are trained to detect the odour ....." in sentence 4. So sentence 4 follows sentence 2.
Sentence 1 concludes the paragraph. The contrast conjunction 'but' in sentence 1 helps to contrast "scant evidence of a smell associated with neurodegenerative disorders" with the point made in sentence 4 (.....spot the fruity smell on the breath of hyperglycaemic diabetics and gastroenterologists are trained to detect the odour of digested blood).
Sentence 1 is followed by sentence 5. "Now one has been found for **Parkinson's** disease" in sentence 5 links with "*there has been scant evidence of a smell associated with **neurodegenerative** disorders" in sentence 1*. So, 32415. Ans: (32415)

Q27. DIRECTIONS *for question 27*: Five sentences related to a topic are given in the question below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

1. It did not: no city nabbed the promised headquarters though local governments wooed the firm with juicy incentives.
2. The gambit might have produced a fascinating experiment in urban development, and a departure from the concentration of top tech firms in a few favoured places.
3. A year ago, the e-commerce giant said it would open a second headquarters and solicited bids from cities keen on the 50000 new jobs and $5 bn in investment it would bring.
4. The decision to bring tens of thousands of high-paying jobs to two of America's richest metropolitan cities is a notable example of a broader trend.
5. In the end, Amazon disappointed everyone.

Sentence 1: Sentence 1 has the pronoun 'it' among other details.
Sentence 2: Sentence 2 refers to 'the gambit' which needs a precedent and more substantiation. It mentions the likely consequence of 'the gambit'.
Sentence 3: Sentence 3 has the reference "the e-commerce giant" and mentions the situation: would open a second headquarters.
Sentence 4: Sentence 4 is a general sentence which establishes a new line of thought "notable example of a broader trend".
Sentence 5: Sentence 5 has the starter: In the end. It mentions the name of the company 'Amazon'.
Note that sentence 3 makes a mention of 'the e-commerce giant' and sentence 5 is the only sentence that has the name of the giant, viz Amazon. So sentence 5 needs to precede sentence 3. Sentence 5 is the only sentence that can begin the paragraph inspite of having a conclusion marker "In the end". Sentence 5 is followed by sentence 3. *"the e-commerce giant" in sentence 3 points to "Amazon" in sentence 5.*
Sentences 3 and 2 form a logical block. ***"open a second headquarters***, and solicited bids from **cities** keen on the 50000 new jobs and $5 bn in investment it would bring" in sentence 3 links with "The gambit might have produced a fascinating experiment in **urban** development, and a ***departure from the concentration of top tech firms in a few favoured places***" in sentence 2. So sentence 3 is followed by sentence 2.
Sentence 1 concludes the paragraph. "It did not" in sentence 1 contrasts "The gambit might have produced a fascinating experiment in urban development" in sentence 2. "no city nabbed the promised **headquarters**" in sentence 1 contrasts "the e-commerce giant said it would open a second **headquarters**" given earlier in sentence 3. "local governments wooed the firm with juicy incentives" in sentence 1 links with "solicited bids from cities" in sentence 3 and with "fascinating experiment in urban development" in sentence 2. Sentence 1 also mirrors the introduction sentence: In the end, Amazon disappointed everyone.
Sentence 4 is the odd sentence out. "notable example of a **broader** trend" needs further substantiation. Sentence 4 can be a part of another para. Ans: (4)

Q28. DIRECTIONS *for questions 28 and 29*: The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.
As with its philosophical history, Existential-Phenomenology takes the human condition in all its wondrous manifestations as the focus of investigation. Existential-Phenomenology emphasises the unfolding nature of human experience and brings a curiosity to what it means to be human. Its aim is to reveal the way in which each individual constructs his or her particular way of being and comes to understand the world. One of the key aims of Existential-Phenomenology is to facilitate a process of reflection and description that reveals with ever more detail and clarity the meaning that arises from our lived experience. We are not trying to merely explain 'why' things happen to be the way they are, but instead to describe 'how' we find ourselves to be – the process with which we involve ourselves.

a) Existential-Phenomenology calls attention to the hidden processes that occur between people – the intersubjective nature of our relationships.

b) Existential-Phenomenology provides the valuable opportunity of uncovering the contradictions, discrepancies and paradoxes that we experience in our everyday lives.

c) Existential-Phenomenology is an organic process, a therapeutic approach that engages with and challenges you to explore and reflect solely on your personal history.

d) Existential-Phenomenology endeavours to understand the way in which we create our own lives and selves by the way we live and come to construct an understanding of the world.

Option A: The para only mentions that Existential – Phenomenology aims to facilitate a process of reflection and description that reveals with ever more detail and clarity the meaning that arises from our lived experience. "hidden processes that occur between people – the intersubjective nature of our relationships" as mentioned in choice A is out of scope and is not exactly what the paragraph talks about. So, choice A is not the correct answer.
Option B: Existential – Phenomenology helps facilitate a process of reflection and description that reveals with ever more detail and clarity the meaning that arises from our lived experience. We not only explore 'why' things happen to be the way they are but also 'how' we find ourselves to be – the process with which we involve ourselves. "contradictions, discrepancies and paradoxes" as given in choice B may cover only one half of a person's lived experience. It does not cover the whole experience. So choice B cannot be the primary position of the author in the para.
Option C: Choice C appears to be true at first glance but it is not correct. There are clever distortions mentioned in this choice. For example, "challenges you to explore", "reflect solely on your personal history". Also "organic process, a therapeutic approach" has not been mentioned or cannot be inferred from the paragraph.
Option D: Choice D provides an accurate essence of the author's primary position in the paragraph. It captures important phrases from the paragraph: unfolding **nature of human experience** and brings a curiosity to what it means to be human, ... each individual comes to understand and construct his or her **particular way of being** and comes to **understand the world**, ... the meaning that arises from our lived experience, 'how' we find ourselves to be – the process with which we involve ourselves.

Choice (D)

Q29. DIRECTIONS *for questions 28 and 29*: The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.
Stephen Covey in his book "Seven Habits" explains the difference between what he describes as the personality ethic and the character ethic. The personality ethic does not challenge us; neither does it bring about deep changes within us. As we look around and within ourselves and recognize the problems created as we live and interact within the personality ethic, we begin to realize that there

are deep, fundamental problems that cannot be solved at the superficial level on which they were created. We need a new level, a deeper level of thinking – a paradigm based on character and on the principles that accurately describe the territory of an effective human being and his interactions – to solve the deep concerns. Covey calls this the “Inside-out” approach, which means to start first with self; even more fundamentally, to start with the most inside part of self – with your paradigms, your character and your motives.

a) All the problems that we face, except for the fundamental ones, can be solved with the same level of thinking that we were at when we created them.

b) In the character ethic vs personality ethic debate, 'character ethic' trumps 'personality ethic': the former emphasises deep changes in us, while the latter falls back on methods or techniques.

c) A character-based, inside-out approach is necessary to effectively counter the problems that we have created when living within the personality ethic.

d) Inside-out is a dramatic paradigm shift for most people and ensures a continuing process of renewal, leading to progressively higher forms of effective interdependence.

Option A: Option A is a distortion of the author’s position. He mentions that we cannot solve fundamental problems with the same level of thinking that we were at when we created them. But this does not imply that the other (non-fundamental) problems can be solved with the same level of thinking. In any case, the author is not trying to highlight that non-fundamental problems can be solved – rather, he is highlighting that fundamental problems cannot be solved.
Option B: Option B reduces the paragraph to a mere contrast or debate between the character ethic vs personality ethic. It does not elaborate on the author's view about the necessity and benefits of the character ethic in our lives.
Option C: Option C correctly describes the view of the author as can be inferred from the second, third and fourth sentences of the paragraph. {.....recognize the **problems** created as we live and interact within the **personality ethic** .... We need a new level, a deeper level of thinking – a paradigm based on **character and on the principles** that accurately describe the territory of an **effective human being and his interactions** – to solve the deep concerns}. Hence Option C is the correct answer.
Option D: Option D only focuses on “Inside Out” leaving out the comparison with the 'personality ethic'. “continuing process of renewal, leading to progressively higher forms of effective interdependence” is not mentioned in the paragraph.

Choice (C)

Q30. DIRECTIONS *for questions 30 and 31*: Five sentences related to a topic are given in the question below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

1. In short, to study Latin is to study history.
2. But his contemporary, Virgil, is majestic.
3. Horace can be a drag – like a bad weekend columnist, always wittering on about his garden and his cellar, except when coming out with quotable drivel about how sweet it is to die in battle.
4. He set himself the most daunting task – giving Rome its own "Iliad" and "Odyssey", in a single epic, while staying on the right side of an emperor – and pulled it off.
5. Latin's literature has stood the test of millennia: Ovid is diverting, Lucretius is stimulating, Cicero is riveting.

The possessive pronoun 'his' in Sentence 2, and the personal pronoun 'he' in Sentence 4 are our two important clues. Sentence 2 also has a negative connector 'But' followed by a positive sentence (as indicated by the word 'majestic'). So, 24 is a block, since Sentence 4 talks about a person in a positive tone. Positive because the person discussed set himself a difficult task and pulled it off (achieved it). This is the first step. So, neither 2 nor 4, can be the Odd sentence out.
Sentence 2 should be preceded by a sentence that talks about a person in a non-positive way, (since but is followed by something positive here, it should be preceded by something negative, and that sentence must have a name because the word 'his' has been used). So, 32 is a logical block ('drag' being a negative word).
So, the OOO is either 1 or 5. Either 5 can be the context-setter for 324, by introducing us to writers in Latin, or 1 can be the conclusion. However, the term 'history' doesn't find anything synonymous in 2 and 3. Only 4 talks about an emperor but the focus is still not on history. On the other hand, 5 has a reference to literature, something carried forward in 324. Ans: (1)

Q31. DIRECTIONS *for questions 30 and 31*: Five sentences related to a topic are given in the question below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out. Choose its number as your answer and key it in.

1. Remarkably, extreme events of diversification and extinction happen more frequently than a typical Gaussian distribution would predict.
2. Throughout life's history on earth, biological diversity has gone through ebbs and flows -- periods of rapid evolution and of dramatic extinctions.
3. Evidence for these ecological changes is found throughout the early and middle Cambrian fossil record but is even more apparent in deposits of exceptional preservation.
4. We know this, at least in part, through the fossil record of marine invertebrates left behind since the Cambrian period.
5. Instead of the typical bell-shaped curve, the fossil record shows a fat-tailed distribution, with extreme, outlier, events occurring with higher-than-expected probability.

We start with looking for a mandatory pair, the sentences which are connected together and hence, wouldn't be candidates for Odd One Out.
Sentence 1 refers to a distribution, and how 'extreme events' don't fit the distribution. The same theme is carried forward even in Sentence 5, where instead of a 'bell-shaped curve', we get a 'fat-tailed distribution'. Both 1 and 5 talk about higher frequency for extreme events. 1 and 5 are a logical block but not a mandatory pair.
Sentence 3 with this demonstrative adjective 'these' referring to ecological changes could probably reference 'ebbs and flows -- periods of rapid evolution and of dramatic extinctions' – the only plural noun that could be referred to as ecological changes in the set of lines given. So, 2 and 3 could be a mandatory pair, making 4 the OOO.
Another way of looking at it is observing the structure of 4. It says – We know 'this' through the fossil record of marine invertebrates. 'This' could be referencing Sentence 2. That makes 3 the OOO. 3 and 4 cannot exist together as both are dependent on the same sentence, 2, and take different directions. Since 2 talks about the theory, the sentence that follows 2 should lead up to 1 and 5 which discuss events and their probability. 4 talks about the Cambrian fossil record referenced in 1 and 5. 3 leads us away through 'but is even more apparent in deposits of exceptional preservation' – a tangential idea from which we cannot go back to the distributions discussed in 1.
(3) takes the focus to exceptional preservation. Ans: (3)

Q32. DIRECTIONS *for questions 32 and 33*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the five sentences and key in the sequence of five numbers as your answer, in the input box given below the question.

1. But neither commercially sourced monarchs nor local individuals raised indoors did.
2. A graduate student discovered this genetic shortfall after buying dozens of monarchs and binding them to a short pole – a common method to test what direction an insect wants to fly.
3. In what may be a cautionary tale for citizen scientists trying to save North America's iconic monarch butterfly, new research has found that butterflies raised in captivity are sometimes unable to migrate – some as a result of missing genes and others for want of the right environmental cues.
4. Tethered wild-caught monarchs consistently headed south, the same direction they fly during their annual journeys from the United States and Canada to Mexico.
5. They tended to head in random directions.

Sentence 1 starts with a contrast marker 'But' followed by a line that references some action with respect to butterflies raised indoors.
Sentence 2 refers to 'genetic shortfall' referencing a previous sentence using 'this'. This could be a theory in effect, a theory that can be summarised as a genetic shortfall. We are looking for something negative because of the term 'shortfall'.
Sentence 3 is an independent sentence, but gives us the genetic shortfall referenced in 2 through the phrase 'some as a result of missing genes'.
Sentence 4 talks about tethered wild-caught monarchs which headed in one direction – South.
Sentence 5 talks about 'they' heading in random directions. So, 5 is in contrast with 4.
Sentence 4 and 2 are connected using the word 'tethered' meaning tied, which is being described in Sentence 2. Tethered butterflies or those tied to a pole consistently headed south. 24 is a logical block preceded by 1. This is in contrast to 1 – 'neither commercially sourced monarchs nor local individuals raised indoors did' – a reference to heading south. Hence, 15 forms a mandatory pair. Ans: (32415)

Q33. DIRECTIONS *for questions 32 and 33*: The sentences given in the following question, when properly sequenced, form a coherent paragraph. Each sentence is labelled with a number. Decide on the proper order for the five sentences and key in the sequence of five numbers as your answer, in the input box given below the question.

1. That doesn't mean we should surrender to some kind of post-truth nihilism.
2. We fight to define ideas and practices against the will of our opponents, even when we know those definitions won't last.
3. Nothing's fixed forever, and everything's always at stake.
4. Instead, critics and activists must search for the breaking points of hegemonic discourse, those weak spots in the architecture of domination.
5. Modern politics and culture involve a permanent contest of values.

Sentence 1 is a retort to some statement that is likely to propagate surrendering/or some synonym of it, since this sentence says that doesn't mean we should surrender.
Sentence 2 is an independent sentence that talks about clash of ideas between us and opponents.
Sentence 3 talks about how things change, and the sentence needs a context.
Sentence 4 starts with a negative connector word, Instead. The rest of the sentence talks about a reverse action, as an answer to something that shouldn't be done. It is clear that 4 follows 1, since 1 clearly says we shouldn't surrender. 4 says, 'instead' we should do 'something else'. Hence, 14 is a pair.
Sentence 5 talks about a contest, thereby referencing Sentence 2. Sentence 5 is more generic (theory) and Sentence 2 is more an elaboration or example of that contest. Hence, 52 is a pair.
Now, 1 starts with 'that doesn't mean'. We need something negative in the preceding sentence. That's because we need something negative before we could explain how that doesn't mean 'we should surrender'. So, 3 is placed before 1, even though it makes sense immediately after 5. So, 314 is a block. 52 talks about the contest or clash, the context needed for the theorizing in the second part. Ans: (52314)

Q34. DIRECTIONS *for question 34*: The paragraph given below is followed by four summaries. Choose the option that best represents the author's primary position in the paragraph.

What characterizes indigenous philosophies? Because they are so culturally diverse, no beliefs can be said to be held by all indigenous peoples. However, there are some ideas that are particularly popular among indigenous societies. This makes a lot of sense when you consider the nature of those societies. Primarily, of course, to be indigenous means to be the 'first' peoples of a colonized land. However, indigenous nations and communities often aren't the very first inhabitants of a land. Many of the Native American nations of the Great Plains were not there first but were pushed onto the plains by the conquerors in the East (and in doing so pushed other nations off the plains). Being indigenous, then, is about more than just being 'first'. It is about a connection to the land. Without that connection we would have left our territories long ago, but many of our ancestors consciously stayed and fought their colonizers. In other words, our very identities as indigenous peoples depend on the thoughts and ideas that drive our stubborn devotion to our land.

a) Indigenous philosophies are an amalgamation of the identities of all the peoples who have inhabited a land, and not just of those who were the 'first'.

b) The nature of an indigenous society, whose identity is defined by the thoughts and ideas which explain its unwavering attachment to its land, helps understand the idea of indigenous philosophies, which are the most popular beliefs held by indigenous peoples.

c) It is not indigenous philosophies which define the identity of the corresponding indigenous societies, but the stubbornness with which some societies are devoted to their land.

d) It is the indigenous philosophy that helps indigenous societies maintain a stubborn devotion to their land, and this devotion, in turn, defines their identities.

The para has three parts. The first part: 'What characterizes indigenous philosophies? Because they are so culturally diverse, no beliefs can be said to be held by all indigenous peoples. However, there are some ideas that are particularly popular among indigenous societies.' This says that indigenous philosophies cannot include all beliefs, but it can be said that there are some which are popular – implying that those could be defined as the indigenous philosophies.
The second part gives the reasoning for the above – that we should look at the nature of these societies and it is important to observe what is an indigenous society.
The third part explains the connection between the stubborn devotion to a land and the beliefs and ideas that make them stubbornly devoted.
Option A: 'Indigenous philosophies are an amalgamation of the identities of all the peoples' – this is incorrect. The author doesn't indicate or assert that there is a blending of all the identities. The author was trying to define who are the indigenous peoples of a land. Option A is not the answer.
Option B: This option explains what the author calls indigenous philosophies and what defines the identity of the indigenous society, the two central ideas of the para. Hence, Option B is the answer.
Option C: The option draws a comparison between philosophy and stubbornness (it is not philosophy but their stubbornness which defines identity). However, such a comparison has not been made in the para. The author talks about philosophy and to elucidate it explains the nature of such societies and what defines their identity. Option C is not the answer.
Option D: The author tries to establish that indigenous philosophy can be taken as the sum total of their popular beliefs/ideas. This can be understood, the author says, from the logic that indigenous people are defined by their stubborn devotion for the land, which in turn is based on their ideas. So, the ideas of these societies which lead to their devotion define the identity. In short, the indigenous philosophy could be the ideas which lead to their devotion of the land and it is the ideas that come to define their identity and not the devotion to the land itself. Option D is not the answer.

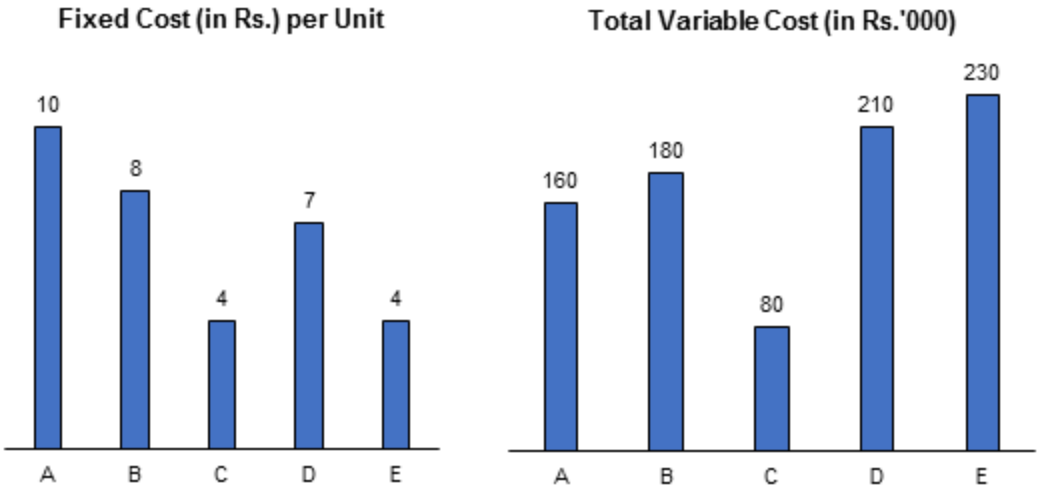
Choice (B)

DILR

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

Five companies, A through E, manufacture writing pads. The Total Cost for each company comprises two components – Fixed Cost and Variable Cost.

During a particular month, the number of writing pads manufactured by the five companies, A through E, are in the ratio 2 : 4 : 5 : 7 : 9, respectively. The following bar graphs provide, for each company, the average Fixed Cost incurred per unit manufactured during the month and the Total Variable Cost incurred during the month.



Q1. DIRECTIONS *for questions 1 and 2:* Select the correct alternative from the given choices. Among the five companies, for which company is the Total Cost incurred the third highest?

a) A

b) D

c) E

d) B

Let the number of units manufactured by A through E be 2n, 4n, 5n, 7n and 9n.
The total Fixed Cost incurred by A = 20n
Total cost incurred by A = 20n + 160
Similarly, total cost incurred by B = 32n + 180
Total cost incurred by C = 20n + 80
Total cost incurred by D = 49n + 210
Total cost incurred by E = 36n + 230

By observing the above values, we can see that the total cost of A has to be greater than that of B (since the Fixed Cost of B (32n) > the Fixed Cost of A (20n) and the Variable Cost of B (180) > the Variable cost of A (160).
Similarly, the Total Cost of C is less than that of both A and B.
The Total Costs of D and E are greater than that of A, B and C.
But, between D and E, we cannot conclude which has the higher Total Cost.
Hence, the company with the third highest Total Cost is B. Choice (D)

Q2. DIRECTIONS *for questions 1 and 2:* Select the correct alternative from the given choices.
If E incurred the highest Total Cost across the five companies, what is the maximum number of writing pads manufactured by C?

a) 7960

b) 7690

c) 6790

d) 6970

Let the number of units manufactured by A through E be 2n, 4n, 5n, 7n and 9n.
The total Fixed Cost incurred by A = 20n
Total cost incurred by A = 20n + 160
Similarly, total cost incurred by B = 32n + 180
Total cost incurred by C = 20n + 80
Total cost incurred by D = 49n + 210
Total cost incurred by E = 36n + 230

Given that E incurred the highest Total Cost.
$\Rightarrow 36n + 230 > 49n + 210 \Rightarrow n < 20000/13 \Rightarrow n < 1538.4$
Hence, the maximum value of n can be manufactured is 1538.
The number of writing pads manufactured by C = $1538 \times 5 = 7690$ Choice (B)

Q3. DIRECTIONS *for questions 3 and 4:* Type in your answer in the input box provided below the question.
If the Variable Cost per unit for one of the five companies is Rs.20, what is the maximum number of writing pads manufactured by E?

Let the number of units manufactured by A through E be 2n, 4n, 5n, 7n and 9n.
The total Fixed Cost incurred by A = 20n
Total cost incurred by A = 20n + 160
Similarly, total cost incurred by B = 32n + 180
Total cost incurred by C = 20n + 80
Total cost incurred by D = 49n + 210
Total cost incurred by E = 36n + 230

For one of the companies, the Variable Cost per unit is ₹20.
To maximize the number of writing pads, we need to select this company so that we get a maximum value for n.
If we consider that A has Variable cost per unit as ₹20, then the number of writing pads manufactured by A = $\frac{Total\ Variable\ Cost}{20} = \frac{160000}{20} = 8000$
⇒ n = 8000/2 = 4000.
Similarly, the values of n if we consider the same for B, C, D and E are 2250, 800, 1500 and 1278 respectively.
The highest value of n occurs if we consider that A has Variable cost per unit as ₹20.
Hence, the maximum number of writing pads manufactured by E = 9 × 4000 = 36000

Ans: (36000)

Q4. DIRECTIONS *for questions 3 and 4:* Type in your answer in the input box provided below the question.
If the difference between the Total Cost per unit for A and for B is Rs.37, what is the Total Cost (in Rs.) incurred by D?

Let the number of units manufactured by A through E be 2n, 4n, 5n, 7n and 9n.
The total Fixed Cost incurred by A = 20n
Total cost incurred by A = 20n + 160
Similarly, total cost incurred by B = 32n + 180
Total cost incurred by C = 20n + 80
Total cost incurred by D = 49n + 210
Total cost incurred by E = 36n + 230

Total Cost per unit for A = 10 + 160000/2n
Total Cost per unit for B = 8 + 180000/4n
Given that $10 + \frac{160000}{2n} - 8 - \frac{180000}{4n} = 37 \Rightarrow \frac{35000}{n} = 35 \Rightarrow n = 1000$
Hence, the total cost incurred by D = 49 × 1000 + 210000 = 259000

Ans: (259000)

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

During a summer morning, Hari was observing from his balcony all the vehicles that passed by on the road that ran by his house. He observed that only trucks and cars passed by his house that

morning. Everytime a truck passed by his house, he placed a Rs.5 coin in a box, which was initially empty, and everytime a car passed by his house, he placed four Rs.1 coins in the box.

Hari initially had a total of 85 Rs.5 coins and 28 Rs.1 coins with him.

If, at any point of time, he did not have enough Rs.1 coins to place in the box when a car passed by his house, he placed a Rs.5 coin in the box and took a Rs.1 coin out from the box.

- After the 10^{th} vehicle passed by his house, there were 27 Rs.1 coins and 3 Rs.5 coins in the box.
- After the 20^{th} vehicle passed by his house, there were 27 Rs.1 coins and 12 Rs.5 coins in the box.
- After the 30^{th} vehicle passed by his house, there were 24 Rs.1 coins and 22 Rs.5 coins in the box.

Q5. DIRECTIONS *for questions 5 and 6:* Select the correct alternative from the given choices.
What is the maximum number of cars that could have passed by his house before the 6^{th} truck passed by his house?

a) 7

b) 10

c) 13

d) 16

Given that after the 10th vehicle passed by his house, there were 27 ₹1 coins in the box. The only way ₹1 coins can go into or out of the box is when a car passes by his house. Since there are 27 ₹1 coins in the box, at least 7 cars must have passed by his house. After 7 cars passed by his house, there will be 28 ₹1 coins in the box.
For the ₹1 coins to be 27, one more car must have passed by his house. In this case, he will place one ₹5 coin in the box and take out one ₹1 coin from the box. Hence, there must have been 8 cars that passed by his house.
The number of ₹5 coins after 10 vehicles is 3. Hence, two trucks must have passed by his house.
Among the first 10 vehicles, 8 must have been cars and 2 must have been trucks.
For the next 10 vehicles, the number of ₹1 coins in the box remained the same, while the number of ₹5 coins increased by 9. If 9 trucks passed by his house, then these must be the only vehicles that passed by. But in this case 10 vehicles could not have passed by his house. Hence, at least one car must have passed by his house.
For the number of ₹1 coins to remain the same, the number of cars that passed by his house must be 5. This is explained below:
Consider the 11th to 15th vehicles were all cars. After the 11th vehicle passed by his house, he will take out one ₹1 coin and put in one ₹5 coin. In this case, the number of ₹1 and ₹5 coins in the box will be 26 and 4 respectively (since there were 27 ₹1 coins and 3 ₹5 coins in the box after the 10th vehicle).
After the 12th vehicle, there will be 25 ₹1 coins and 5 ₹5 coins.
After the 13th vehicle, there will be 24 ₹1 coins and 6 ₹5 coins.
After the 14th vehicle, there will be 28 ₹1 coins and 6 ₹5 coins (because he has enough number of ₹1 coins to put in the box).
After the 15th vehicle, there will be 27 ₹1 coins and 7 ₹5 coins. Hence, after 5 cars, the number of ₹1 coins will be the same as before these 5 cars.
Hence, if there were 5 cars among the 11th to 20th vehicle, the number of ₹1 and ₹5 coins will be 27 and 7 respectively. If there were 5 trucks, the number of ₹1 and ₹5 coins will be 27 and 12 respectively.
Among the 11th to 20th vehicles, 5 must have been cars and 5 must have been trucks.
For the next ten vehicles, the number of ₹1 coins reduced by 3. If there were 3 cars, the number of ₹1 coins will decrease by 3 and the number of ₹5 coins will increase by 3. If there were 7 trucks, the number of ₹5 coins will increase by 7. Hence, the number of ₹1 and ₹5 coins after the 30th vehicle will be 24 and 22 respectively.
Among the 21st to 30th vehicles, 3 must have been cars and 7 must have been trucks.

The sixth truck would have been among the 11th to 20th vehicles. The maximum number of cars that could have passed by his house will be 8 + 5 = 13.

Choice (C)

Q6. DIRECTIONS *for questions 5 and 6:* Select the correct alternative from the given choices. Among the first 30 vehicles that passed by his house, how many were trucks?

a) 12

b) 14

c) 22

d) 16

Given that after the 10th vehicle passed by his house, there were 27 ₹1 coins in the box. The only way ₹1 coins can go into or out of the box is when a car passes by his house. Since there are 27 ₹1 coins in the box, at least 7 cars must have passed by his house. After 7 cars passed by his house, there will be 28 ₹1 coins in the box.
For the ₹1 coins to be 27, one more car must have passed by his house. In this case, he will place one ₹5 coin in the box and take out one ₹1 coin from the box. Hence, there must have been 8 cars that passed by his house.
The number of ₹5 coins after 10 vehicles is 3. Hence, two trucks must have passed by his house.
Among the first 10 vehicles, 8 must have been cars and 2 must have been trucks.
For the next 10 vehicles, the number of ₹1 coins in the box remained the same, while the number of ₹5 coins increased by 9. If 9 trucks passed by his house, then these must be the only vehicles that passed by. But in this case 10 vehicles could not have passed by his house. Hence, at least one car must have passed by his house.
For the number of ₹1 coins to remain the same, the number of cars that passed by his house must be 5. This is explained below:
Consider the 11th to 15th vehicles were all cars. After the 11th vehicle passed by his house, he will take out one ₹1 coin and put in one ₹5 coin. In this case, the number of ₹1 and ₹5 coins in the box will be 26 and 4 respectively (since there were 27 ₹1 coins and 3 ₹5 coins in the box after the 10th vehicle).
After the 12th vehicle, there will be 25 ₹1 coins and 5 ₹5 coins.
After the 13th vehicle, there will be 24 ₹1 coins and 6 ₹5 coins.
After the 14th vehicle, there will be 28 ₹1 coins and 6 ₹5 coins (because he has enough number of ₹1 coins to put in the box).
After the 15th vehicle, there will be 27 ₹1 coins and 7 ₹5 coins. Hence, after 5 cars, the number of ₹1 coins will be the same as before these 5 cars.
Hence, if there were 5 cars among the 11th to 20th vehicle, the number of ₹1 and ₹5 coins will be 27 and 7 respectively. If there were 5 trucks, the number of ₹1 and ₹5 coins will be 27 and 12 respectively.
Among the 11th to 20th vehicles, 5 must have been cars and 5 must have been trucks.
For the next ten vehicles, the number of ₹1 coins reduced by 3. If there were 3 cars, the number of ₹1 coins will decrease by 3 and the number of ₹5 coins will increase by 3. If there were 7 trucks, the number of ₹5 coins will increase by 7. Hence, the number of ₹1 and ₹5 coins after the 30th vehicle will be 24 and 22 respectively.
Among the 21st to 30th vehicles, 3 must have been cars and 7 must have been trucks.

Among the first 30 vehicles that passed by his house, 2 + 5 + 7 = 14 were trucks.

Choice (B)

Q7. DIRECTIONS *for questions 7 and 8:* Type in your answer in the input box provided below the question.
After the last vehicle passed by his house, the number of cars and trucks that passed by his house were in the ratio 2 : 1. Further, more than 30 vehicles passed by his house.

What is the minimum number of Rs.5 coins in the box after the last vehicle passed by his house?

Given that after the 10th vehicle passed by his house, there were 27 ₹1 coins in the box. The only way ₹1 coins can go into or out of the box is when a car passes by his house. Since there are 27 ₹1 coins in the box, at least 7 cars must have passed by his house. After 7 cars passed by his house, there will be 28 ₹1 coins in the box.
For the ₹1 coins to be 27, one more car must have passed by his house. In this case, he will place one ₹5 coin in the box and take out one ₹1 coin from the box. Hence, there must have been 8 cars that passed by his house.
The number of ₹5 coins after 10 vehicles is 3. Hence, two trucks must have passed by his house.
Among the first 10 vehicles, 8 must have been cars and 2 must have been trucks.
For the next 10 vehicles, the number of ₹1 coins in the box remained the same, while the number of ₹5 coins increased by 9. If 9 trucks passed by his house, then these must be the only vehicles that passed by. But in this case 10 vehicles could not have passed by his house. Hence, at least one car must have passed by his house.
For the number of ₹1 coins to remain the same, the number of cars that passed by his house must be 5. This is explained below:
Consider the 11th to 15th vehicles were all cars. After the 11th vehicle passed by his house, he will take out one ₹1 coin and put in one ₹5 coin. In this case, the number of ₹1 and ₹5 coins in the box will be 26 and 4 respectively (since there were 27 ₹1 coins and 3 ₹5 coins in the box after the 10th vehicle).
After the 12th vehicle, there will be 25 ₹1 coins and 5 ₹5 coins.
After the 13th vehicle, there will be 24 ₹1 coins and 6 ₹5 coins.
After the 14th vehicle, there will be 28 ₹1 coins and 6 ₹5 coins (because he has enough number of ₹1 coins to put in the box).
After the 15th vehicle, there will be 27 ₹1 coins and 7 ₹5 coins. Hence, after 5 cars, the number of ₹1 coins will be the same as before these 5 cars.
Hence, if there were 5 cars among the 11th to 20th vehicle, the number of ₹1 and ₹5 coins will be 27 and 7 respectively. If there were 5 trucks, the number of ₹1 and ₹5 coins will be 27 and 12 respectively.
Among the 11th to 20th vehicles, 5 must have been cars and 5 must have been trucks.
For the next ten vehicles, the number of ₹1 coins reduced by 3. If there were 3 cars, the number of ₹1 coins will decrease by 3 and the number of ₹5 coins will increase by 3. If there were 7 trucks, the number of ₹5 coins will increase by 7. Hence, the number of ₹1 and ₹5 coins after the 30th vehicle will be 24 and 22 respectively.
Among the 21st to 30th vehicles, 3 must have been cars and 7 must have been trucks.

To minimize the number of coins in the box, we need to minimize the number of vehicles that passed by his house. Till the 30th vehicle, there were 16 cars and 14 trucks.
For the cars and trucks to be in the ratio 2 : 1, at least 12 cars must have passed by his house.
If an additional 12 cars passed by his house, i.e., the 31st to 42nd vehicle are all cars, then for every set of 5 cars, the number of ₹1 coins will not change but the number of ₹5 coins will increase by 4. Since there were 24 ₹1 coins and 22 ₹5 coins after the 30th vehicle, after the 35th vehicle (assuming all are cars), there will be 24 ₹1 coins and 26 ₹5 coins. After the 40th vehicle, there will be 24 ₹1 coins and 30 ₹5 coins.
After the 41st vehicle, there will be 28 ₹1 coins and 30 ₹5 coins. After the 42nd vehicle there will be 27 ₹1 coins and 31 ₹5 coins.
Hence, there will be a minimum of 31 ₹5 coins in the box. Ans: (31)

Q8. DIRECTIONS *for questions 7 and 8:* Type in your answer in the input box provided below the question.

After the last vehicle passed by his house, the number of cars and trucks that passed by his house were in the ratio 2 : 1. Further, more than 30 vehicles passed by his house.

What is the minimum number of Rs.5 coins that Hari has left?

Given that after the 10th vehicle passed by his house, there were 27 ₹1 coins in the box. The only way ₹1 coins can go into or out of the box is when a car passes by his house. Since there are 27 ₹1 coins in the box, at least 7 cars must have passed by his house. After 7 cars passed by his house, there will be 28 ₹1 coins in the box.
For the ₹1 coins to be 27, one more car must have passed by his house. In this case, he will place one ₹5 coin in the box and take out one ₹1 coin from the box. Hence, there must have been 8 cars that passed by his house.
The number of ₹5 coins after 10 vehicles is 3. Hence, two trucks must have passed by his house.
Among the first 10 vehicles, 8 must have been cars and 2 must have been trucks.
For the next 10 vehicles, the number of ₹1 coins in the box remained the same, while the number of ₹5 coins increased by 9. If 9 trucks passed by his house, then these must be the only vehicles that passed by. But in this case 10 vehicles could not have passed by his house. Hence, at least one car must have passed by his house.
For the number of ₹1 coins to remain the same, the number of cars that passed by his house must be 5. This is explained below:
Consider the 11th to 15th vehicles were all cars. After the 11th vehicle passed by his house, he will take out one ₹1 coin and put in one ₹5 coin. In this case, the number of ₹1 and ₹5 coins in the box will be 26 and 4 respectively (since there were 27 ₹1 coins and 3 ₹5 coins in the box after the 10th vehicle).
After the 12th vehicle, there will be 25 ₹1 coins and 5 ₹5 coins.
After the 13th vehicle, there will be 24 ₹1 coins and 6 ₹5 coins.
After the 14th vehicle, there will be 28 ₹1 coins and 6 ₹5 coins (because he has enough number of ₹1 coins to put in the box).
After the 15th vehicle, there will be 27 ₹1 coins and 7 ₹5 coins. Hence, after 5 cars, the number of ₹1 coins will be the same as before these 5 cars.
Hence, if there were 5 cars among the 11th to 20th vehicle, the number of ₹1 and ₹5 coins will be 27 and 7 respectively. If there were 5 trucks, the number of ₹1 and ₹5 coins will be 27 and 12 respectively.
Among the 11th to 20th vehicles, 5 must have been cars and 5 must have been trucks.
For the next ten vehicles, the number of ₹1 coins reduced by 3. If there were 3 cars, the number of ₹1 coins will decrease by 3 and the number of ₹5 coins will increase by 3. If there were 7 trucks, the number of ₹5 coins will increase by 7. Hence, the number of ₹1 and ₹5 coins after the 30th vehicle will be 24 and 22 respectively.
Among the 21st to 30th vehicles, 3 must have been cars and 7 must have been trucks.

To minimize the number of coins that Hari has left, we need to maximize the number of vehicles that passed by his house.
Hari has a total of 85 × 5 + 28 = ₹453.
For each car, he places ₹4 in the box, while for each truck, he places ₹5 in the box.
Also, let the number of cars be 2n and the number of trucks be n (from the given ratio).
The total amount that he places in the box will be 4 × 2n + 5n = 13n
Hence, n = 453/13 = 34.85
We can take n = 34 and check whether this satisfies all the conditions.
For n = 34, there will be 68 cars and 34 trucks.
For the 34 trucks, he will place 34 ₹5 coins in the box. Hence, he will be left with 51 ₹5 coins and 28 ₹1 coins.
Let the next 7 vehicles be cars. He will have only 51 ₹5 coins.
For every set of 5 cars, he has to place 4 ₹5 coins in the box. Hence, after 12 such sets, i.e., after 60 cars, he will place 48 ₹5 coins in the box. He will be left with 3 ₹5 coins. Hence, after the 67th car, he will have 3 ₹5 coins left.
After the 68th car, he will have one ₹1 coin and two ₹5 coins left. Ans: (2)

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

Rajesh has three different types of cubes:

- 1-unit cubes, i.e., cubes of side 1 unit
- 2-unit cubes, i.e., cubes of side 2 units
- 3-unit cubes, i.e., cubes of side 3 units.

All the 1-unit cubes are painted Blue on all sides; all the 2-unit cubes are painted Red on all sides; all the 3-unit cubes are painted Green on all sides.

He uses these cubes to form cubes of larger sizes. Any cube that he forms does not have any hollow spaces inside the cube.

Q9. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
If Rajesh made a cube of side 5 units using exactly two different types of cubes, the number of 1-unit cubes that he would have used is at least

a) 98.

b) 125.

c) 61.

d) 0.

To make a cube of side 5 units using exactly two different cubes, Rajesh can use 3-unit cubes and 1-unit cubes OR 2-unit cubes and 1-unit cubes. He cannot construct a cube of side 5 units using only 3-unit cubes and 2-unit cubes.
(This can be verified mathematically in the following manner. The volume of 3-unit cube is 27, while the volume of a 2-unit cube is 8.
To form a 5-unit cube, using these cubes, we need to have an equation of the form $27x + 8y = 125$, where x and y are integers. Checking for various values, we can see that for any value of x, the value of y cannot be an integer. Hence, a 5-unit cube cannot be formed using only 3-unit cubes and 2-unit cubes.
If he uses 3-unit cubes and 1-unit cubes, he can use at most one 3-unit cube. If he uses one more 3-unit cube, then one of the dimensions of the larger cube will become 6 units. Hence, he must use one 3-unit cube and the remaining must be 1-unit cubes.
Since a 5-unit cube requires 125 unit cubes, and the 3-unit cube is occupies 27 unit cubes of volume, the number of 1-unit cube required is $125 - 27 = 98$
If he uses 2-unit cubes, he can form a cube of side 4 units, by using eight 2-unit cubes. The number of 1-unit cubes required = $125 - 64 = 61$. Hence, the minimum number of 1-unit cubes required is 61. Choice (C)

Q10. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
If Rajesh made a cube of side *n* units using exactly one 3-unit cube, such that all the visible faces of the cube of side *n* units are completely Red, what is the minimum number of cubes that he would have used?

a) 27

b) 75

c) 128

d) 94

All the faces of the 3-unit cube are painted Green on all sides. It is given that in the larger cube, all the faces are Red. Hence, all the outside faces must be from the 2-unit cubes.
For the 3-unit cube to not be visible outside, the minimum possible size of the larger cube must be 5 units (only then will the 3-unit cube be hidden from view).
However, if the entire outer layer is to be formed using only 2-unit cubes, the size of the larger cube must be an even number. Hence, the minimum possible size of the larger cubes must be 6 units.
The 2-unit cubes can be used to construct the outer layer of a 6-unit cube. However, if the outer layer is formed using 2-unit cubes, then the available place inside this cube will only be 2 × 2 × 2 (we need 26 2-unit cubes to form the outer layer of the 6-unit cube. This implies that the remaining volume is $6^3 - 26 \times 2^3 = 8$). A 3-unit cube cannot be used in this case.
The next possible size is a cube of side 8 units. If the outer layer of this cube is formed using 2-unit cubes, then the available space inside this cube is 4 × 4 × 4. In this space, we can place the 3-unit cube and fill the remaining space with 1-unit cubes.
The number of 1-unit cubes required = $4^3 - 3^3 = 37$
The number of 2-unit cubes required = 56
Number of 3-unit cubes used = 1
Total number of cubes = 37 + 56 + 1 = 94 Choice (D)

Q11. DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
If Rajesh made a cube of side *n* units, where $n \leq 9$, using exactly one 1-unit cube, such that all the visible faces of the cube of side *n* units are of the same colour, what is the maximum number of 3-unit cubes that he would have used?

a) 0

b) 9

c) 26

d) 18

Since we need to maximize the number of 3-unit cubes, we will start by taking the maximum possible value of n. Consider n = 9.
If all the cubes which are on the outside are 3-unit cubes, then there will be a gap of $3 \times 3 \times 3$ in the middle of the cube. This cannot be filled using only 1-unit cubes and other 2-unit or 3-unit cubes.
All the cubes which are on the outside cannot be 2-unit cubes because using 2-unit cubes we cannot form a cube having an odd number as its side.
Consider n = 8.
All the cubes which are on the outside cannot be 3-unit cubes (since n is even).
If all the cubes which are on the outside are 2-unit cubes, then there will be a gap of $4 \times 4 \times 4$ in the middle of the cube. This gap cannot be filled with one 1-unit cube and other 2-unit or 3-unit cubes.
Consider n = 7.
The cubes on the outside cannot be 3-unit cubes alone or 2-unit cubes alone.
Consider n = 6.
If all the cubes on the outside are 3-unit cubes, then there will be no gap in the inside of this cube.
If all the cubes on the outside are 2-unit cubes, then there will be a gap of $2 \times 2 \times 2$ on the inside. However, this cannot be filled using exactly one 1-unit cube and any combination of 3-unit and 2-unit cubes.
Similarly, for n = 5, the cubes on the outside can neither be 3-unit cubes alone nor be 2-unit cubes alone.
For n = 4, 3 and 2, we do not get any possibility.
As we can see, using only 1-unit cube, it is not possible to construct any cube of larger size (with $n \leq 9$), whose faces are all of the same colour. Hence, the 1-unit cube is the largest possible cube that can be made whose faces are all of the same colour.
∴ The maximum number of 3-unit cubes that can be used is 0. Choice (A)

Q12. 12.DIRECTIONS *for questions 9 to 12:* Select the correct alternative from the given choices.
If Rajesh made a cube of side 9 units such that he used at least one 1-unit cube, at least one 2-unit cube and at least one 3-unit cube, what is the minimum number of cubes that he would have used?

a) 40

b) 46

c) 52

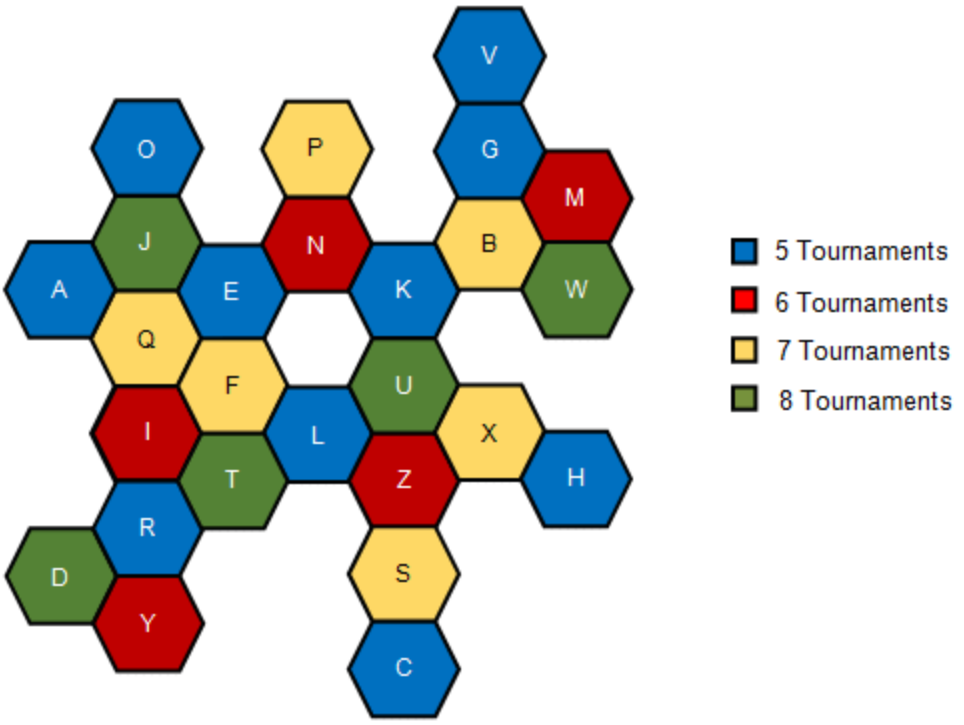
d) 48

To minimize the total number of cubes required, we can consider that the outer layer of the 9-unit cube is made using 3-unit cubes.
This leaves a space of 3 × 3 × 3 on the inside. One 2-unit cube can be placed here along with 27 – 8 = 19 1-unit cubes.
Hence, a minimum of 26 + 1 + 19 = 46 cubes will be required. Choice (B)

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

During a particular year, 26 tennis players, A through Z, participated in several tennis tournaments. In any tournament, each player participated either as Singles (in which each player plays individually) or as part of a Doubles team (in which two players play as a team), but not both. No player teamed up with the same player in more than one tournament.

In the tile map given below, each hexagonal tile represents a tennis player. Any pair of players played as a Doubles team in a tournament if and only if the pair of hexagons which represent the two players are adjacent to each other (i.e., the two hexagons share a side). Further, the colour of any hexagon represents the number of tournaments that the player participated in (either in Singles or as part of Doubles team) during the year. This information is provided in the legend alongside the tile map.



Q13. DIRECTIONS *for questions 13 to 16:* Select the correct alternative from the given choices.
What is the highest number of tournaments played as Singles by any player during the year?

a) 4

b) 7

c) 6

d) 5

For any player, the number of hexagons that surround the hexagon that represents that player indicates the number of tournaments that he played as Doubles.
We can find the total number of tournaments that each player payed based on the shading of the hexagon which represents that player.
From these two, we can find the number of tournaments that each player played as Singles.
By observation, we can see that the maximum number of tournaments that any player played as Singles is 6 (for D, P, W). Choice (C)

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

Considering all the Doubles teams that were formed among these 26 players during the year, how many teams had at least one player who did not play more than 6 tournaments during the year?

a) 29

b) 31

c) 33

d) 35

The hexagons that represent the players who played at most 6 tournaments will be shaded Blue or Red.
The players who played 5 tournaments are A, O, R, E, L, K, G, V, H and C.
The total number of distinct players that each of them played with = 2 + 1 + 4 + 4 + 4 + 3 + 3 + 0 + 1 + 1 = 23
The players who played 6 tournaments are I, Y, N, Z and M.
The total number of distinct players that each of them played with (excluding the pairs counted above) = 3 + 1 + 1 + 3 + 2 = 10
Hence, the total number of pairs = 23 + 10 = 33. Choice (C)

Q15. DIRECTIONS *for questions 13 to 16:* Select the correct alternative from the given choices.
For any player, S_1 represents the set of all players with whom he played as part of Doubles team, during the year.

For which of the following players is the sum of the number of singles tournaments played by each player in S_1 the highest?

a) F

b) U

c) R

d) J

Option A: F played as part of Doubles team with E, Q, I, T and L.
The number of tournaments that each of these players played as Singles = 1 + 2 + 2 + 4 + 1 = 10
Hence, the sum of the elements in S_2 is 10.
Option B: U played with K, L, Z and X.
The number of tournaments that these players played as Singles = 2 + 1 + 2 + 4 = 9
Hence, the sum of elements in S_2 is 9.
Option C: R played with T, I, D and Y.
The number of tournaments that these players played as Singles = 4 + 2 + 6 + 4 = 16
Hence, the sum of elements in S_2 is 16.
Option D: J played with O, A, Q and E.
The number of tournaments that these players played as Singles = 4 + 3 + 2 + 1 = 10
Hence, the sum of elements in S_2 is 10.
∴ Among the given options, the sum of elements in S_2 is the highest for R.

Choice (C)

Q16. DIRECTIONS *for questions 13 to 16:* Select the correct alternative from the given choices.
For any player, S_1 represents the set of all players with whom he played as part of Doubles team, during the year.

For how many players is the sum of the number of singles tournaments played by each player in S_1 less than 5?

a) 6

b) 7

c) 5

d) 4

From the above solutions, we see that D, W and P played 6 tournaments as Singles. The players whose tiles are adjacent to each of these players will definitely have the sum of S_2 at least 6. Hence, R, Y, B, M, N will not have sum of elements in S_2 as less than 5.
Similarly, S played 5 tournaments as Singles. Hence, Z and C can also not have sum of elements of S_2 as less than 5.
The players who have played 4 tournaments as Singles are
the players whose tiles are Blue and have only one adjacent tile :O, V, C, H,
the players whose tiles are Red and have two adjacent tiles: Y
the players whose tiles are Yellow and have three adjacent tiles: X
the players whose tiles are Green and have four adjacent tiles: T, J, U.
The players whose tiles are adjacent to any the above will satisfy the condition only if they do not have any other tiles adjacent to them.
The players whose tiles are adjacent to any of the above players are J, G, S, X, D, R, U, Z, H, F, I, L, A, O, Q, E, K.
Among these players, only O and H have no other tile adjacent to it. Hence, for each of O and H, the sum of elements in S_2 is less than 5.
The list of players whose sum of elements in S_2 cannot be less than 5 are A, B, C, D, E, F, G, I, J, K, L, M, N, Q, R, S, U, X, Y and Z.
The remaining players are H, O, P, T and V.
Of these players, we know the sums of elements in S_2 for H and O are 4 each.
For P, the sum of elements in $S_2 = 3$
For T, the sum of elements in $S_2 = 2 + 2 + 1 + 1 = 6$
For V, the sum of elements in $S_2 = 3$.
Hence, only for four players, H, O, P and V, the given condition is satisfied.

Choice (D)

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

In an exam hall, exactly 25 chairs were arranged in the form of a 5 × 5 grid, all facing the same direction, to seat the candidates scheduled to appear for a particular exam. The five rows of the grid are labelled Row 1 through Row 5, while the five columns are labelled Column 1 through Column 5.

On the exam day, exactly 15 candidates, A through O, appeared for the exam and occupied 15 chairs, while the rest of the chairs were empty.

The following tables provide the number of chairs that were occupied in each row and in each column of the grid and some of the candidates who were sitting in that row/column:

Row	No. of Chairs Occupied	Candidates
1	3	A, F
2	2	J, O
3	3	D, K
4	4	E, B
5	3	M, N

Column	No. of Chairs Occupied	Candidates
1	2	N, O
2	4	C, G
3	3	A, J
4	3	M, D
5	3	H, I

Q17. DIRECTIONS *for question 17:* Select the correct alternative from the given choices.
Which of the following chairs is definitely empty?

a) The chair in Row 5 and Column 2

b) The chair in Row 4 and Column 4

c) The chair in Row 3 and Column 3

d) The chair in Row 1 and Column 2

From the two tables, we can see that A is sitting in Row 1 and Column 3.
Similarly, D is sitting in Row 3 and Column 4.
M is sitting in Row 5 and Column 4.
N is sitting in Row 5 and Column 1.
O is sitting in Row 2 and Column 1.
J is in Row 2 and Column 3.
Only two persons are sitting in Column 1. We know that N and O are sitting in Column 1. Hence, all the other chairs of Column 1 must be empty.
The chair in Row 4 and Column 1 must be empty. But we know that there must be 4 persons sitting in Row 4. Hence, all the other chairs (except for the chair in Column 1) in Row 4 must be occupied.
In Column 4, we know that D is sitting in Row 3 and M is in Row 5. Also, in Column 4, Row 4 must be occupied. Since there are only 3 persons in Column 4, the other chairs in Column 4 must be empty.
In Row 1, the chairs in Column 1 and Column 4 are empty. Since there are 3 persons in Row 1, all the other chairs must be occupied.
In Column 3, three chairs are occupied – the one in Row 1 (by A), the one in Row 2 (by J) and the one in Row 4. Since there are only three persons in Column 3, the other chairs in Column 3 must be empty.
In Row 2, the chair in Column 1 and the chair in Column 3 are occupied. Since there are only two persons in Row 2, the other chairs in this row must be empty.
There must be 4 persons in Column 2 and the chair in Row 2 and Column 2 is empty. Hence, all the other chairs must be occupied.
In Row 5, the chairs in Column 1, in Column 2 and Column 4 are occupied. Hence, the others in this row must be empty.
The chair in Row 3 and Column 5 must be occupied.
In the following grid, a shaded cell indicates a chair that is empty and non-shaded cell indicates a chair that is occupied. Below each column and next to each row, the list of persons who must be present in that row/column is provided.

Column / Row	1	2	3	4	5	
1			A			F
2	O		J			
3				D		K
4						E, B
5	N			M		
		C, G			H, I	

Among the given options, the chair in Row 3 and Column 3 is empty. Choice (C)

Q18. DIRECTIONS *for questions 18 and 19:* Each of the following questions is followed by two statements, I and II. Assess whether the question can be answered using the information provided in the statements and enter your answer, in the input box provided below the question, as

1. if the question can be answered using statement I alone but not using statement II alone.
2. if the question can be answered using statement II alone but not using statement I alone.
3. if the question can be answered using either statement I or statement II alone.
4. if the question can be answered using both statement I and statement II together.
5. if the question cannot be answered even by using both statement I and statement II together.

6. if the question can be answered using neither statement I nor statement II.

In which chair is F sitting?

I. K is sitting in the fifth column.
II. E is sitting in the same column as K.

From the two tables, we can see that A is sitting in Row 1 and Column 3.
Similarly, D is sitting in Row 3 and Column 4.
M is sitting in Row 5 and Column 4.
N is sitting in Row 5 and Column 1.
O is sitting in Row 2 and Column 1.
J is in Row 2 and Column 3.
Only two persons are sitting in Column 1. We know that N and O are sitting in Column 1. Hence, all the other chairs of Column 1 must be empty.
The chair in Row 4 and Column 1 must be empty. But we know that there must be 4 persons sitting in Row 4. Hence, all the other chairs (except for the chair in Column 1) in Row 4 must be occupied.
In Column 4, we know that D is sitting in Row 3 and M is in Row 5. Also, in Column 4, Row 4 must be occupied. Since there are only 3 persons in Column 4, the other chairs in Column 4 must be empty.
In Row 1, the chairs in Column 1 and Column 4 are empty. Since there are 3 persons in Row 1, all the other chairs must be occupied.
In Column 3, three chairs are occupied – the one in Row 1 (by A), the one in Row 2 (by J) and the one in Row 4. Since there are only three persons in Column 3, the other chairs in Column 3 must be empty.
In Row 2, the chair in Column 1 and the chair in Column 3 are occupied. Since there are only two persons in Row 2, the other chairs in this row must be empty.
There must be 4 persons in Column 2 and the chair in Row 2 and Column 2 is empty. Hence, all the other chairs must be occupied.
In Row 5, the chairs in Column 1, in Column 2 and Column 4 are occupied. Hence, the others in this row must be empty.
The chair in Row 3 and Column 5 must be occupied.
In the following grid, a shaded cell indicates a chair that is empty and non-shaded cell indicates a chair that is occupied. Below each column and next to each row, the list of persons who must be present in that row/column is provided.

Column / Row	1	2	3	4	5	
1			A			F
2	O		J			
3				D		K
4						E, B
5	N			M		
		C, G			H, I	

From Statement I, if K is sitting in Column 5, K must be sitting in Row 3 and Column 5.
In Column 5, H and I must be in Row 1 and Row 4, in any order.
F must be in Row 1 and Column 2.
Hence, we can answer this question using this statement alone.
From Statement II, if K and E are to be in the same column, they can be in Column 5 OR Column 2. They cannot sit in Column 5 because H and I must also sit in Column 5 and only 3 chairs are occupied in Column 5.
Hence, K and E must be in Column 2. K must be in Row 3 and E must be in Row 4.
Since C and G must be in Column 2, they must be in Row 1 and Row 5 in any order.
Since F must be in Row 1, F must be sitting in Column 5.
Hence, we can answer the question using this statement alone.
∴ The question can be answered using either statement alone. Ans: (3)

Q19. DIRECTIONS *for questions 18 and 19:* Each of the following questions is followed by two statements, I and II. Assess whether the question can be answered using the information provided in the statements and enter your answer, in the input box provided below the question, as

1. if the question can be answered using statement I alone but not using statement II alone.
2. if the question can be answered using statement II alone but not using statement I alone.
3. if the question can be answered using either statement I or statement II alone.
4. if the question can be answered using both statement I and statement II together.
5. if the question cannot be answered even by using both statement I and statement II together.
6. if the question can be answered using neither statement I nor statement II.

Are B and G sitting in the same row?

I. L is sitting in the same row as H.
II. C is not sitting in the same row as N.

From the two tables, we can see that A is sitting in Row 1 and Column 3.
Similarly, D is sitting in Row 3 and Column 4.
M is sitting in Row 5 and Column 4.
N is sitting in Row 5 and Column 1.
O is sitting in Row 2 and Column 1.
J is in Row 2 and Column 3.
Only two persons are sitting in Column 1. We know that N and O are sitting in Column 1. Hence, all the other chairs of Column 1 must be empty.
The chair in Row 4 and Column 1 must be empty. But we know that there must be 4 persons sitting in Row 4. Hence, all the other chairs (except for the chair in Column 1) in Row 4 must be occupied.
In Column 4, we know that D is sitting in Row 3 and M is in Row 5. Also, in Column 4, Row 4 must be occupied. Since there are only 3 persons in Column 4, the other chairs in Column 4 must be empty.
In Row 1, the chairs in Column 1 and Column 4 are empty. Since there are 3 persons in Row 1, all the other chairs must be occupied.
In Column 3, three chairs are occupied – the one in Row 1 (by A), the one in Row 2 (by J) and the one in Row 4. Since there are only three persons in Column 3, the other chairs in Column 3 must be empty.
In Row 2, the chair in Column 1 and the chair in Column 3 are occupied. Since there are only two persons in Row 2, the other chairs in this row must be empty.
There must be 4 persons in Column 2 and the chair in Row 2 and Column 2 is empty. Hence, all the other chairs must be occupied.
In Row 5, the chairs in Column 1, in Column 2 and Column 4 are occupied. Hence, the others in this row must be empty.
The chair in Row 3 and Column 5 must be occupied.
In the following grid, a shaded cell indicates a chair that is empty and non-shaded cell indicates a chair that is occupied. Below each column and next to each row, the list of persons who must be present in that row/column is provided.

Column / Row	1	2	3	4	5	
1			A			F
2	O		J			
3				D		K
4						E, B
5	N			M		
		C, G			H, I	

From Statement I, if L is sitting in the same row as H, then H and L must be sitting in Row 4. In addition to this, B and E must also be in Row 4. Hence, G cannot be sitting in Row 4.
∴ We can answer this question using Statement I alone.
From Statement II, C is not sitting in the same row as G. From this, we cannot infer where G is sitting. Hence, we cannot answer this question using Statement II alone.
∴ The question can be answered using Statement I alone, but not using Statement II alone. Ans: (1)

Q20. DIRECTIONS *for question 20:* Select the correct alternative from the given choices.
How many of the following pairs of persons are definitely not sitting in the same column?

I. B, L II. B, K III. L, E

a) 0

b) 1

c) 2

d) 3

From the two tables, we can see that A is sitting in Row 1 and Column 3.
Similarly, D is sitting in Row 3 and Column 4.
M is sitting in Row 5 and Column 4.
N is sitting in Row 5 and Column 1.
O is sitting in Row 2 and Column 1.
J is in Row 2 and Column 3.
Only two persons are sitting in Column 1. We know that N and O are sitting in Column 1. Hence, all the other chairs of Column 1 must be empty.
The chair in Row 4 and Column 1 must be empty. But we know that there must be 4 persons sitting in Row 4. Hence, all the other chairs (except for the chair in Column 1) in Row 4 must be occupied.
In Column 4, we know that D is sitting in Row 3 and M is in Row 5. Also, in Column 4, Row 4 must be occupied. Since there are only 3 persons in Column 4, the other chairs in Column 4 must be empty.
In Row 1, the chairs in Column 1 and Column 4 are empty. Since there are 3 persons in Row 1, all the other chairs must be occupied.
In Column 3, three chairs are occupied – the one in Row 1 (by A), the one in Row 2 (by J) and the one in Row 4. Since there are only three persons in Column 3, the other chairs in Column 3 must be empty.
In Row 2, the chair in Column 1 and the chair in Column 3 are occupied. Since there are only two persons in Row 2, the other chairs in this row must be empty.
There must be 4 persons in Column 2 and the chair in Row 2 and Column 2 is empty. Hence, all the other chairs must be occupied.
In Row 5, the chairs in Column 1, in Column 2 and Column 4 are occupied. Hence, the others in this row must be empty.
The chair in Row 3 and Column 5 must be occupied.
In the following grid, a shaded cell indicates a chair that is empty and non-shaded cell indicates a chair that is occupied. Below each column and next to each row, the list of persons who must be present in that row/column is provided.

Column / Row	1	2	3	4	5	
1			A			F
2	O		J			
3				D		K
4						E, B
5	N			M		
		C, G			H, I	

Option I: If B and L are sitting in the same column, then they must be sitting in Column 2.
In Row 1, F must be in Column 5. In Row 3, K must be in Column 5. However, H and I must also be in Column 5. Since 4 persons cannot sit in three chairs, this is not possible.
Hence, B and L cannot sit in the same column.
Option II: B and K can sit in Column 2. In Column 2, C and G can be in Row 1 and Row 5 in any order. F can be in Row 1 and Column 5. H and I can be in Row 3 and Row 4 of Column 5. Hence, B and K can sit in the same column.
Option III: L and E must be in Column 2. E must be in Row 4. In Column 2, the other two persons must be C and G. However, K and F must both be in Column 5. This is not possible as H and I must also be in Column 5. Hence, L and E also cannot be in the same column.
Therefore, the options given in I and III are not possible. Choice (C)

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

During a particular day, Raghu, the coach of a school basketball team, was asked to select a team comprising exactly six students from nine students, A through I.

i. One of the nine students approached Raghu and requested Raghu that he would not prefer to be in the team, if B is in the team.
ii. Later, another student approached Raghu and requested him that he would prefer to be in the team only if A is not in the team.
iii. Then, a third student approached Raghu and requested him that he would prefer to be in the team only if neither G nor H is in the team.

Raghu, being the coach, is not obliged to satisfy any of the requests made by the students. However, he decided to list some of the possible teams that he can form if he were to satisfy all the three requests and came up with the following possible teams: ABDFGH, BDEFGH, CDEFGH.

Q21.
DIRECTIONS *for questions 21 and 22:* Select the correct alternative from the given choices.

Who was the first student who approached Raghu?

a) C

b) E

c) I

d) Either C or I

From (i), one of the students said that he cannot be in the team if B was in the team. From the teams that Raghu came up with, this student cannot be A, D, E, F, G or H, since B is in a team with each of them. Hence, this student can only be C or I.
From (ii), one of the students said that he cannot be in the team if A is in the team. From the given teams, this student cannot be B, D, F, G or H. Hence, this student can be C or E or I.
From (iii), one of the students said that he cannot be in the team if either G or H is in the team. From the given teams, this cannot be A, B, C, D, E, F. Hence, this student has to be I.
Since the third student is I, the first student must have been C and the second student must have been E.

The first student to approach Raghu was C. Choice (A)

Q22.
DIRECTIONS *for questions 21 and 22:* Select the correct alternative from the given choices. In how many ways can Raghu form the team satisfying all the three conditions?

a) 3

b) 4

c) 6

d) 8

From (i), one of the students said that he cannot be in the team if B was in the team. From the teams that Raghu came up with, this student cannot be A, D, E, F, G or H, since B is in a team with each of them. Hence, this student can only be C or I.
From (ii), one of the students said that he cannot be in the team if A is in the team. From the given teams, this student cannot be B, D, F, G or H. Hence, this student can be C or E or I.
From (iii), one of the students said that he cannot be in the team if either G or H is in the team. From the given teams, this cannot be A, B, C, D, E, F. Hence, this student has to be I.
Since the third student is I, the first student must have been C and the second student must have been E.

Among the nine students, Raghu must exclude three students to form a team of 6.
Between B and C, one must not be there.
Between A and E, one must not be there.
If I is there, both G and H cannot be in the team. However, if I is there, then a team of 6 cannot be formed. Hence, I must not be in the team.
Therefore, Raghu can form the team in four ways: ABDFGH, BDEFGH, CDEFGH, ACDFGH. Choice (B)

Q23. DIRECTIONS *for questions 23 and 24:* Type in your answer in the input box provided below the question.
If Raghu wanted to form a team such that only the requests of the last two students who approached him are satisfied, in how many ways can he form a team?

From (i), one of the students said that he cannot be in the team if B was in the team. From the teams that Raghu came up with, this student cannot be A, D, E, F, G or H, since B is in a team with each of them. Hence, this student can only be C or I.
From (ii), one of the students said that he cannot be in the team if A is in the team. From the given teams, this student cannot be B, D, F, G or H. Hence, this student can be C or E or I.
From (iii), one of the students said that he cannot be in the team if either G or H is in the team. From the given teams, this cannot be A, B, C, D, E, F. Hence, this student has to be I.
Since the third student is I, the first student must have been C and the second student must have been E.

If we consider only the last two requests, then E and A cannot be in the team together. I can be in the team only if G and H are not in the team.
If I is in the team, then G and H cannot be in the team. Between E and A, one student cannot be in the team. Hence, there are two possible teams: ABCDFI and BCDEFI.
If I is not in the team, then at least one student among E and A cannot be in the team. Among the other seven students, one student must not be in the team. If E is in the team, there can be 7 possible teams. If A is in the team, there can be another 6 possible teams (not counting I, E and A to be outside the team).
Hence, a total of 2 + 7 + 6 = 15 teams are possible. Ans: (15)

Q24. DIRECTIONS *for questions 23 and 24:* Type in your answer in the input box provided below the question.
If Raghu wanted to form a team such that only the requests of the first two students who approached him are satisfied, in how many ways can he form a team?

From (i), one of the students said that he cannot be in the team if B was in the team. From the teams that Raghu came up with, this student cannot be A, D, E, F, G or H, since B is in a team with each of them. Hence, this student can only be C or I.
From (ii), one of the students said that he cannot be in the team if A is in the team. From the given teams, this student cannot be B, D, F, G or H. Hence, this student can be C or E or I.
From (iii), one of the students said that he cannot be in the team if either G or H is in the team. From the given teams, this cannot be A, B, C, D, E, F. Hence, this student has to be I.
Since the third student is I, the first student must have been C and the second student must have been E.

If we consider only the first two requests, then between B and C, at least one student cannot be in the team. Between E and A, at least one student cannot be in the team.
If one among B and C and one among A and B are not in the team, among the other 5 students, 4 must be in the team.
Hence, a total of $2 \times 2 \times 5 = 20$ teams are possible.
If both B and C are not in the team, then there are 2 possible teams (with either A or E out of the team).
If both A and E are not in the team, then there are 2 possible teams (with either B or C out of the team).
Therefore, a total of $20 + 2 + 2 = 24$ teams are possible. Ans: (24)

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

In a company, there are exactly four departments – Marketing, Strategy, Operations and Finance. Each employee of the company belongs to exactly one department. Further, each employee in any department can have a designation of Analyst, Officer, Manager or Supervisor. In any department, the number of Analysts is greater than that of Officers, which, in turn, is greater than that of Managers, which, in turn, is greater than that of Supervisors. At least one Supervisor is present in each department.

It is also known that

i. the number of Analysts in Strategy is the same as the number of Officers in Operations.
ii. the number of Officers in Finance is the same as the number of Managers in Marketing.
iii. the number of Analysts in Finance is the same as the number of Officers in Strategy.
iv. the total number of employees in each department is the same.

Q25. DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.

What is the minimum number of employees in the company?

a) 76

b) 84

c) 88

d) 96

Since there is at least one Supervisor in each department, the number of Managers, Officers and Analysts in any department must be at least 2, 3 and 4, respectively.
Since there are z Analysts in Finance, z must be at least 4.
Also, since there are x Analysts in Strategy, x must be at least 4.
However, since there are z Officers in Strategy, and z is at least 4, the number of Analysts in Strategy (i.e., x) must be at least 5.
If there are 5 Analysts in Strategy, then there must be 5 Officers in Operations. There must be 4 Officers in Strategy (i.e., z) and 4 Analysts in Finance.
Hence, in Finance, the number of Officers, Managers and Supervisors must be 3, 2 and 1 respectively. Hence, there must be 10 employees in Finance and also in each of the other departments.
Since there are 3 Officers in Finance, there must be 3 Managers in Marketing.
If there are 3 Managers in Marketing, there must be at least 4 Officers and 5 Analysts.
However, the number of employees in Marketing, in this case, becomes more than 10.
Hence, this case is not possible.
If we take z = 5, then we can take x to be a minimum of 6.
If z = 5, then the maximum number of employees in Finance must be 5 + 4 + 3 + 2 = 14.
In Marketing, there will be 4 Managers. This implies that there must be at least 5 Officers and 6 Analysts. The number of Managers, Officers and Analysts, itself, is more than 14. Hence, this case is also not possible.
If z = 6, then we can take x to be a minimum of 7.
The maximum number of employees in Finance = 6 + 5 + 4 + 3 = 18.
The number of Managers in Marketing must be 5. The number of Managers, Officers and Analysts must be at least 5 + 6 + 7 = 18.
Hence, this is also not possible, (since there must be at least one supervisor in Marketing).
If z = 7, then we can take x to be a minimum of 8.
The maximum number of employees in Finance = 7 + 6 + 5 + 4 = 22.
The number of Managers in Marketing must be 6. The number of Managers, Officers and Analysts must be at least 6 + 7 + 8 = 21. There can be one Supervisor in Marketing.
Checking for the other departments, we can see that in Strategy, there can be 8 Analysts, 7 Officers. The other 7 employees can be Managers and Supervisors.
In Operations, there can be 9 Analysts, 8 Officers. The other 5 employees can be Managers and Supervisors.
The following table provides the number of employees in each department of the company:

	Marketing	Strategy	Operations	Finance
Analysts	8	8	9	7
Officers	7	7	8	6
Managers	6	7	5	5
Supervisors	1			4
Total	22	22	22	22

Hence, there must be a minimum of 22 employees in each department and a total of 88 employees in the company. Choice (C)

Q26. DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.
If the number of employees in the company is the minimum possible, what is the maximum number of Managers in Operations?

a) 3

b) 4

c) 5

d) 6

Let the number of Analysts in Strategy be x. From (i), the number of Officers in Operations must also be x.
Let the number of Officers in Finance be y. From (ii), the number of Managers in Marketing is also y.
Let the number of Analysts in Finance be z. From (iii), the number of Officers in Strategy is also z.
The following table provides this information:

	Marketing	Strategy	Operations	Finance
Analysts		x		z
Officers		z	x	y
Managers	y			
Supervisors				

From the above solution, the number of Managers and Supervisors in Operations must be 5.
Since there must be at least one Supervisor, the maximum number of Managers in Operations is 4. Choice (B)

Q27. DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.
If the number of Managers in at least two of the four departments is the same, what is the minimum total number of Supervisors in the company?

a) 4

b) 10

c) 8

d) 7

Let the number of Analysts in Strategy be x. From (i), the number of Officers in Operations must also be x.
Let the number of Officers in Finance be y. From (ii), the number of Managers in Marketing is also y.
Let the number of Analysts in Finance be z. From (iii), the number of Officers in Strategy is also z.
The following table provides this information:

	Marketing	Strategy	Operations	Finance
Analysts		x		z
Officers		z	x	y
Managers	y			
Supervisors				

In the above solution, the number of Managers can be 5 for Strategy and Finance or 6 for Marketing and Strategy.
In the first case, the minimum number of Supervisors = 1 + 2 + 1 + 4 = 8
In the second case, the minimum number of Supervisors = 1 + 1 + 1 + 4 = 7
Hence, the minimum total number of Supervisors in the company is 7. Choice (D)

Q28. DIRECTIONS *for questions 25 to 28:* Select the correct alternative from the given choices.
If there are 30 employees in each department, what is the minimum number of Analysts in Finance?

a) 7

b) 8

c) 9

d) 10

Let the number of Analysts in Strategy be x. From (i), the number of Officers in Operations must also be x.
Let the number of Officers in Finance be y. From (ii), the number of Managers in Marketing is also y.
Let the number of Analysts in Finance be z. From (iii), the number of Officers in Strategy is also z.
The following table provides this information:

	Marketing	Strategy	Operations	Finance
Analysts		x		z
Officers		z	x	y
Managers	y			
Supervisors				

From the above solution, we can see that there are at least 22 employees in Finance. Also, the minimum number of Analysts in Finance is 7.
If we add 1 employee to each cell of the table, then all the conditions will be satisfied and the total number of employees will become 26. Similarly, if we add one more to each cell of the table, the total number of employees will become 30.
In this case, to minimize the number of Analysts in Finance, the numbers of Analysts, Officers, Managers and Supervisors must be as close to each other as possible. By adding 2 to each cell of the table (as described above), we get these numbers to be 9, 8, 7 and 6.
Since these numbers cannot be closer (as they have to be distinct), the minimum number of Analysts in Finance is 9. Choice (C)

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

Six candidates, A through F, participated in a dancing contest in which each candidate was given a score on a scale of 0 to 100 on each of four parameters – Movement, Coordination, Skill and Costume. The following table provides the scores given to each of the six persons in each parameter:

	A	B	C	D	E	F
Movement	67	78	69	81	56	91
Coordination	84	60	72	68	81	84
Skill	92	81	79	61	80	65
Costume	51	72	61	70	84	68

The winner of the contest was decided in the following manner:

i. For each candidate, the difference between his highest score in any parameter and his lowest score in any parameter is calculated. This is called the Deviation of that candidate.
ii. For each candidate, the Average Score across the four parameters is calculated.
iii. For each candidate, the Performance Index of that candidate is calculated by subtracting his Deviation from his Average Score.
iv. The six candidates are ranked, from 1 to 6, in the descending order of their Performance Index and the candidate ranked first is declared the winner of the contest.

Q29. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.
Which candidate won the competition?

a) B

b) C

c) D

d) F

The following table provides the Deviation, the average, the Performance Index and the ranks of the six candidates:

Candidate	Deviation	Average	Performance Index	Rank
A	41	73.50	32.50	6
B	21	72.75	51.75	2
C	18	70.25	52.25	1
D	20	70.00	50.00	4
E	28	75.25	47.25	5
F	26	77.00	51.00	3

C won the competition. Choice (B)

Q30. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.
How many candidates have a Deviation greater than that of the candidate ranked second?

a) 2

b) 3

c) 4

d) 5

The following table provides the Deviation, the average, the Performance Index and the ranks of the six candidates:

Candidate	Deviation	Average	Performance Index	Rank
A	41	73.50	32.50	6
B	21	72.75	51.75	2
C	18	70.25	52.25	1
D	20	70.00	50.00	4
E	28	75.25	47.25	5
F	26	77.00	51.00	3

The Deviation of the candidate ranked second (i.e., B) was 21. Three candidates, A, E and F, a have a higher deviation than this. Choice (B)

Q31. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.
For which of the following pairs of candidates is the difference between their Performance Index greater than the difference between their Average Scores?

a) B and C

b) C and E

c) D and E

d) E and F

The following table provides the Deviation, the average, the Performance Index and the ranks of the six candidates:

Candidate	Deviation	Average	Performance Index	Rank
A	41	73.50	32.50	6
B	21	72.75	51.75	2
C	18	70.25	52.25	1
D	20	70.00	50.00	4
E	28	75.25	47.25	5
F	26	77.00	51.00	3

Difference of Performance Index for B and C = 0.5
Difference of Average Score for B and C = 2.5
Difference of Performance Index for C and E = 5
Difference of Average Score for C and E = 5
Difference of Performance Index for D and E = 2.75
Difference of Average Score for D and E = 5.25
Difference of Performance Index for E and F = 3.75
Difference of Average Score for E and F = 1.75
Only for E and F, the given condition is satisfied. Choice (D)

Q32. DIRECTIONS *for questions 29 to 32:* Select the correct alternative from the given choices.
For how many candidates is the number of candidates with a Deviation greater than theirs the same as the number of candidates with an Average Score greater than theirs?

a) 0

b) 1

c) 2

d) More than 2

Q1. DIRECTIONS *for questions 1 and 2:* Select the correct alternative from the given choices.
Under simple interest, if a sum becomes three times itself in eight years, in how many years will it become 30 times itself?

a) 80 years

b) 96 years

c) 116 years

d) 120 years

The following table provides the Deviation, the average, the Performance Index and the ranks of the six candidates:

Candidate	Deviation	Average	Performance Index	Rank
A	41	73.50	32.50	6
B	21	72.75	51.75	2
C	18	70.25	52.25	1
D	20	70.00	50.00	4
E	28	75.25	47.25	5
F	26	77.00	51.00	3

For A, the number of candidates with a greater Deviation and the number of candidates with a greater Average Score is 0 and 2 respectively.
For B, the number of candidates with a greater Deviation and the number of candidates with a greater Average Score is 3 and 3 respectively.
For C, the number of candidates with a greater Deviation and the number of candidates with a greater Average Score is 5 and 4 respectively.
For D, the number of candidates with a greater Deviation and the number of candidates with a greater Average Score is 4 and 5 respectively.
For E, the number of candidates with a greater Deviation and the number of candidates with a greater Average Score is 1 and 1 respectively.
For F, the number of candidates with a greater Deviation and the number of candidates with a greater Average Score is 2 and 0 respectively.
Hence, the given condition is satisfied for two candidates, B and E. Choice (C)

QA

Q1. DIRECTIONS *for questions 1 and 2:* Select the correct alternative from the given choices.
Under simple interest, if a sum becomes three times itself in eight years, in how many years will it become 30 times itself?

a) 80 years

b) 96 years

c) 116 years

d) 120 years

$$P + 8P\,\frac{r}{100} = 3P$$

$$\Rightarrow \frac{r}{100} = \frac{1}{4}$$

Let the sum become 30 times after N years

$$P + N\,\frac{Pr}{100} = 30P$$

$$N\,\frac{r}{100} = 29$$

$$N = 116$$

Choice (C)

Q2. DIRECTIONS *for questions 1 and 2:* Select the correct alternative from the given choices.
For an infinite geometric progression, with common ratio *r*, if the ratio of the sum to infinite terms to the sum to *n* terms is approximately 1.1444, which of the following combinations of values can *r* and *n* assume?

a) $r = 0.547$, $n = 5$

b) $r = 0.772$, $n = 8$

c) $r = 0.697$, $n = 7$

d) $r = 0.711$, $n = 9$

Given $\frac{1}{1-r} : \frac{1-r^n}{1-r} = 1.144$

$\therefore \frac{1}{1-r^n} = 1.144$

$\Rightarrow r^n = 1 - \frac{1}{1.1444} \cong 0.1262$

Now, calculating and checking for each of the options, using the on-screen calculator, only option B, i.e., r = 0.772 and n = 8, satisfies. Choice (B)

Q3. DIRECTIONS *for question 3:* Type in your answer in the input box provided below the question.
What is the last digit of $258^{35} + 393^{58}$?

The last digits of powers of 8 are 8, 4, 2, 6…i.e., a period of 4.
The last digits of powers of 3 are 3, 9, 7, 1…i.e., a period of 4.
The last digit of 258^{35} will be 2 ($\because$ 35 = 4k + 3)
The last digit of 393^{58} will be 9 ($\because$ 58 = 4k + 2)
Hence, the last digit of $258^{35} + 393^{58}$ will be 1. Ans: (1)

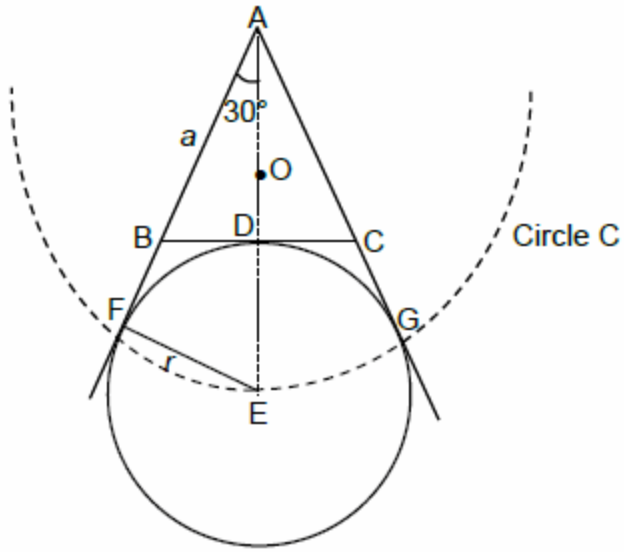
Q4. DIRECTIONS *for question 4:* Select the correct alternative from the given choices.
An ex-circle of a given triangle is drawn outside the triangle, tangent to one of the sides of the triangle, such that the other two sides, when extended, are also tangent to it. An equilateral triangle of side *a* is taken and all its three possible ex-circles are drawn. A circle C is then drawn, passing through the centres of all the three ex-circles. If the area of circle C is 9π sq.units, what is the value of *a* (in units)?

a) $2\sqrt{3}$

b) $\frac{3\sqrt{3}}{2}$

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

d) $\frac{\sqrt{3}}{4}$



Consider the above figure, where AB and AC are extended and the ex-circle is shown with centre E.
Now, the centre of the circle C (shown in dashed line) will be the centroid (O) of ΔABC and AE = EF/sin30° = 2*r*
⇒ AD = *r*

Now, AD $= \frac{a\sqrt{3}}{2}$ and OD $= \frac{1}{3}$(AD) $= \frac{1}{3}\left(\frac{a\sqrt{3}}{2}\right)$

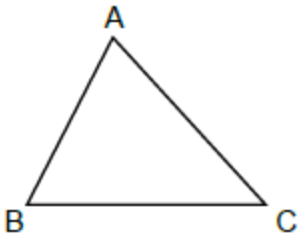
AE = AD + DE $= r + \frac{a\sqrt{3}}{2} = 2r$ or $r = \frac{a\sqrt{3}}{2}$

EO = radius of the larger circle = 3 cms.

Hence $\frac{a\sqrt{3}}{2} + \frac{1}{3}\left(\frac{a\sqrt{3}}{2}\right) = 3$; $a = \frac{3\sqrt{3}}{2}$. Choice (B)

Q5. DIRECTIONS *for questions 5 to 7:* Type in your answer in the input box provided below the question.

In a triangle ABC, if $\frac{\sin B - \sin A}{\sin B + \sin A} = \frac{1}{4}$ and side BC measures 24 cm, find the measure (in cm) of side AC.



Using the sine rule,

$$\frac{AC}{\sin B} = \frac{BC}{\sin A}$$

$$\therefore AC = \frac{\sin B}{\sin A}(BC)$$

It is given that $\frac{\sin B - \sin A}{\sin B + \sin A} = \frac{1}{4}$

$4\sin B - 4\sin A = \sin B + \sin A$

$3\sin B = 5\sin A$

$$\Rightarrow \frac{\sin B}{\sin A} = \frac{5}{3}$$

$$\therefore AC = \frac{5}{3}(BC) = \frac{5}{3}(24) = 40$$

Ans: (40)

Q6. DIRECTIONS *for questions 5 to 7:* Type in your answer in the input box provided below the question.

A student wrote N consecutive natural numbers, starting from 1, on a blackboard and then found their sum. Another student came along and erased the least number on the board and found the sum of the remaining numbers. In this manner students came along and erased the least number on the board, in each case finding the sum of the remaining numbers, until the number left on the board was N. If the average of all the sums found by the students is 188, find N.

The sum found by the student who wrote the numbers
= [1 + 2 + 3 . . . + N]
Sum found by the student who erased the least number
= [2 + 3 + . . . N].
Sum found by the student who crossed the next least number = [3 + . . . + N].
Sum found by the student who crossed the number N – 1 = N.
Total of the sums found by the students = [1 + 2 + 3 + . . . N] + [2 + 3 + . . . N] + [3 + . . . N] + [N]
= 1 + 2(2) + 3(3) . . . N(N)
= $1^2 + 2^2 + 3^2 \ldots N^2$

$$= \frac{N(N+1)(2N+1)}{6}$$

$$\therefore \frac{\frac{N(N+1)(2N+1)}{6}}{N} = 188$$

$\therefore$ (N + 1) (2N + 1) = 1128 = (24) (47)
Comparing the two sides,
N + 1 = 24 $\Rightarrow$ N = 23. Ans: (23)

Q7. DIRECTIONS *for questions 5 to 7:* Type in your answer in the input box provided below the question.
How many triangles having integer sides (in cm) can be formed with a perimeter of 45 cm?

Let the sides of the triangle be a, b and c where c is the longest side.
as $a + b > c$

$$c < \frac{45}{2} = 22.5$$

The possible values of a, b, c and the number of values are tabulated below

a	b	c	No. of values
1 2 . . . 11	22 21 . . . 12	22	11
3 . . . 12	21 . . . 12	21	10
5 . . . 12	20 . . . 13	20	8
7 . . . 13	19 . . . 13	19	7
9 . . . 13	18 . . . 14	18	5
11 . . . 14	17 . . . 14	17	4
13 14	16 15	16	2
15	15	15	1

A total of (11 + 10) + (8 + 7) + (5 + 4) + (2 + 1) or 48 can be formed. Ans: (48)

Q8. DIRECTIONS *for questions 8 to 14:* Select the correct alternative from the given choices.

A shopkeeper purchases ten watches at a price of Rs.2000 each. He later finds out that two of the watches are defective and cannot be sold. What should be the selling price of each watch that he sells, if he is to earn a 15% profit overall?

a) Rs.2,300

b) Rs.2,375

c) Rs.2,875

d) Rs.3,125

Total cost of purchasing 10 watches = 20000
For earning 15% profit, he has to sell the watches for 23000.
Since he can sell only 8 watches, price of each watch
= ₹2875. Choice (C)

Q9. DIRECTIONS *for questions 8 to 14:* Select the correct alternative from the given choices.

If the ratio of the ages of two boys, A and B, in 2010 was $\frac{3}{5}$, which of the following can be the ratio of their ages in 2016?

a) $\frac{12}{19}$

b) $\frac{13}{23}$

c) $\frac{4}{7}$

d) $\frac{9}{17}$

Let the ages of A and B in 2010 be '*a*' years and '*b*' years respectively.

It is given that, $\frac{a}{b}=\frac{3}{5}$.

Now, $\frac{a+6}{b+6}>\frac{a}{b}\ \left(\because\frac{a}{b}<1\right)$

Of the given options, only option (A), i.e., $\frac{12}{19}$, satisfies this criterion Choice (A)

Q10. DIRECTIONS *for questions 8 to 14:* Select the correct alternative from the given choices.
Two cylinders have equal height and the difference in their curved surface areas is 440 sq.cm. What is the greatest possible difference in their radii, given that their height (in cm) is a multiple of 5?

a) 14 cm

b) 7 cm

c) 10 cm

d) 12 cm

Let the height of each cylinder be h and the radii of the two cylinders be r_1 and r_2. $(r_1 > r_2)$

Given, $2\pi hr_1 - 2\pi hr_2 = 440$.

$2\times\left(\frac{22}{7}\right)h\,(r_1-r_2)=440$

$\Rightarrow h(r_1-r_2)=70$

$\Rightarrow r_1-r_2=\frac{70}{h}$

As we want greatest difference in radii, height should be the least. As h is a multiple of 5, when $h = 5$, $r_1 - r_2 = 14$ cm, is the greatest difference. Choice (A)

Q11. DIRECTIONS *for questions 8 to 14:* Select the correct alternative from the given choices.
A tank is one-third full and a drain pipe at the bottom of the tank can empty it in 15 minutes. If water is now pumped into the tank, without closing the drain pipe, at a rate such that the tank is filled in 10 minutes, then find the ratio of the rate at which the water is pumped in and the rate at which the drain empties the tank.

a) 3

b) 4

c) 5

d) 2

The drain pipe can empty one-third of the capacity of the tank in 15 minutes.

$\therefore$ In 10 minutes it emptied $\frac{10}{15}\left(\frac{1}{3}V\right)=\frac{2}{9}V$

Volume of water pumped into the tank in 10 minutes

$=V-\left(\frac{1}{3}V-\frac{2}{9}V\right)=\frac{8}{9}V$

Therefore the pumping rate is $\left(\frac{8}{9}\right):\left(\frac{2}{9}\right)$, i.e., 4 times the draining rate.

Choice (B)

Q12. DIRECTIONS *for questions 8 to 14:* Select the correct alternative from the given choices.
Nine mangoes, four apples and six pineapples cost Rs.114. If four mangoes, six apples and nine pineapples also cost Rs.114, what is the cost of five mangoes?

a) Rs.30

b) Rs.45

c) Rs.40

d) Cannot be determined

Let the cost of each mango, apple and pineapple (in rupees) be m, a, p respectively.
$9m + 4a + 6p = 114$ ..... (i)
$4m + 6a + 9p = 114$ ..... (ii)
3(i) – 2 (ii) gives $19\,m = 114$
$\Rightarrow m = 6$
$\therefore$ cost of five mangoes = ₹30

Choice (A)

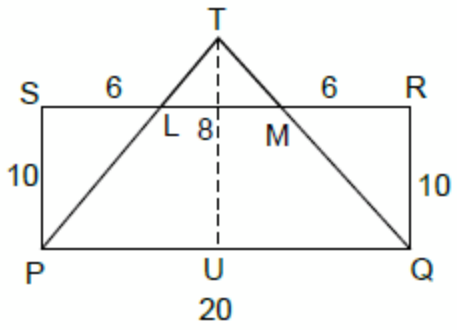
Q13. DIRECTIONS *for questions 8 to 14:* Select the correct alternative from the given choices.
PQRS is a rectangle, of area 200 sq units, with length and breadth in the ratio of 2 : 1 (PQ > QR). PQT is a triangle in which PT = QT. If PT cuts SR at L and QT cuts SR at M and the area of triangle SLP is 30 square units, then the length (in units) of the altitude of the triangle PQT, through T, is

a) $\frac{50}{3}$.

b) 20.

c) $\frac{70}{3}$.

d) 25.



Let PQ = $2x$, QR = x
Area = $2x^2 = 200 \Rightarrow x = 10$
$\Rightarrow$ PQ = 20 units and QR = 10 units
Area of triangle SLP = 30 units

Let SL = $y \Rightarrow \frac{1}{2}$ (10) (y) = 30 sq.units

$\Rightarrow y = 6$ units
Let the altitude, TU = h

Area of triangle TPQ = $\frac{1}{2}$ (h) (20)

= Area of triangle TLM + Area of quadrilateral PLMQ

$\frac{1}{2}$ (h) (20) = $\frac{1}{2}$ (h – 10) (8) + $\left[\frac{1}{2}(8+20)10\right]$

$\Rightarrow h(20) = (h - 10)8 + 280 \Rightarrow 12h = 200$

$h = \frac{200}{12} = \frac{100}{6} = \frac{50}{3}$ units. Choice (A)

Q14. DIRECTIONS *for questions 8 to 14:* Select the correct alternative from the given choices.
Find the area (in sq. units) included between the curve $x^2 + y^2 - 6x - 8y = 0$ and the coordinate axes such that for any point (x, y) within that area, $xy < 0$.

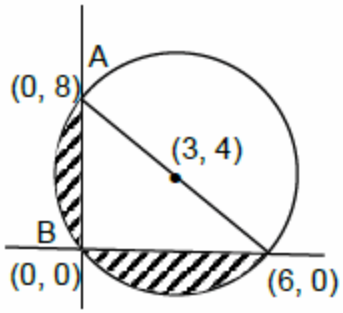
(Take $\pi = \frac{22}{7}$)

a) 18

b) 24

c) $15\frac{2}{7}$

d) $21\frac{5}{7}$



$x^2 + y^2 - 6x - 8y = 0$
adding 25 to both sides
$\Rightarrow x^2 - 6x + 9 + y^2 - 8y + 16 = 25$
$(x - 3)^2 + (y - 4)^2 = 5^2$ is the equation of a circle with the centre at (3, 4) and radius 5, as shown above.
We need to find the area of the shaded region ($xy < 0$).
= Area of the semicircle – Area of Δ ABC

$$= \frac{\frac{22}{7}(5)^2}{2} - \frac{1}{2}(6)(8) = \frac{11 \times 25}{7} - 24$$

$$= \frac{275 - 168}{7} = \frac{107}{7} = 15\frac{2}{7} \text{ square units}$$ Choice (C)

Q15. DIRECTIONS *for questions 15:* Type in your answer in the input box provided below the question.
If the product of three consecutive natural numbers is 153*n*, when *n* is a natural number, find the minimum possible value of *n*.

$153n = 17 \times 9 \times n$
$\therefore$ If 153n is written as a product of three consecutive natural numbers, one of them should be 17.
The possibilities are : $17 \times 16 \times 15$,
$18 \times 17 \times 16$,
$19 \times 18 \times 17$
Since n is a natural number, the product needs to have a multiple of 9. Also, for n to be minimum, the product $18 \times 17 \times 16$ is considered.
$\therefore 153n = 18 \times 17 \times 16$
$\therefore n = 32$ Ans: (32)

Q16. DIRECTIONS *for questions 16 and 17:* Select the correct alternative from the given choices.

Find the sum of the series $S = \frac{6}{1^4+1^2+1} + \frac{12}{2^4+2^2+1} + \frac{18}{3^4+3^2+1} + \ldots + \frac{162}{27^4+27^2+1} + \frac{168}{28^4+28^2+1}$.

a) $3\frac{7}{813}$

b) $2\frac{270}{271}$

c) $3\frac{1}{813}$

d) $2\frac{250}{813}$

$$T_n = \frac{6n}{n^4+n^2+1} = 3\left[\frac{2n}{n^4+n^2+1}\right] = 3\left[\frac{1}{n^2-n+1} - \frac{1}{n^2+n+1}\right]$$

$$\therefore S = 3\left[\left(\frac{1}{1^2-1+1} - \frac{1}{1^2+1+1}\right) + \left(\frac{1}{2^2-2+1} - \frac{1}{2^2+2+2}\right) + \left(\frac{1}{3^2-3+1} - \frac{1}{3^2+3+1}\right) + \ldots + \left(\frac{1}{28^2-28+1} - \frac{1}{28^2+28+1}\right)\right]$$

$\therefore$ Now $n^2 + n + 1 = (n+1)^2 - (n+1) + 1$

$\therefore \frac{1}{1^2+1+1} = \frac{1}{2^2-2+1}$ and $\frac{1}{2^2+2+1} = \frac{1}{3^2-3+1}$ and so on

$$= 3\left[\frac{1}{1} - \frac{1}{28^2+28+1}\right]$$

$$= 3\left[1 - \frac{1}{813}\right]$$

$$= 3\left[\frac{812}{813}\right] = \frac{812}{271}$$

$$= 2\frac{270}{271}$$

Choice (B)

Q17. DIRECTIONS *for questions 16 and 17:* Select the correct alternative from the given choices.

Two boys Ajay and Bijay start simultaneously from P towards Q. At the same time another boy, Chatur, started from Q towards P. After Bijay travelled exactly one-third of the distance PQ, both Ajay and Bijay reversed their direction (but maintained their respective speeds) and travelled towards P, while Chatur continued in his initial direction and met Ajay exactly at P. Which of the following ratios can be found using the information given?

I. Ratio of the speeds of Ajay and Bijay
II. Ratio of the speeds of Bijay and Chatur
III. Ratio of the speeds of Chatur and Ajay

a) Only II

b) Only III

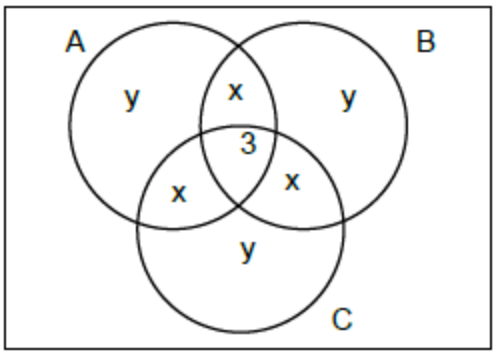
c) I, II and III

d) None of I, II and III

Ajay and Bijay started from P at the same time, travelled for same time, both reversed their direction at the same time and hence, they reach P at the same time. But it is also given that Chatur who starts from Q reaches P at the same time as Ajay did.
⇒ All three reach P at the same time.
It is also given that, Bijay reversed the direction after travelling $\frac{1}{3}$ (PQ). So, he travelled a total of $\frac{2}{3}$ (PQ) before he reached P.
⇒ The time taken by Bijay to travel $\frac{2}{3}$ (PQ) is same as the time taken Chatur to travel (PQ). Hence we can find the ratio of their speeds (2 : 3). Choice (A)

Q18. DIRECTIONS *for questions 18:* Type in your answer in the input box provided below the question.
There are three sets – A, B and C. The number of elements in A∩B∩C is three, whereas the number of elements in A∪B∪C is 30. If the number of elements in A∩B, B∩C and A∩C are equal and each of A, B and C has 16 elements, find the number of elements in A∩B.

We represent the given information in a venn diagram.



As the number of elements in each set is 16.
$2x + y + 3 = 16$
$\Rightarrow 2x + y = 13$ - (1)
As $A \cup B \cup C = 30$
$3x + 3y + 3 = 30$
$x + y = 9$ - (2)
Solving (1) and (2), we get $x = 4$ and $y = 5$
Therefore the number of elements in $A \cap B$ is 7. Ans: (7)

Q19. DIRECTIONS *for questions 19 to 23:* Select the correct alternative from the given choices.
All integers from 1 to 2000 are written on a blackboard. A single operation consists of erasing any two of the integers on the board and then writing their product on the board. After 1998 such operations,

a) precisely two numbers will be left on the board but their product will depend on the order in which the operations are performed.

b) precisely two numbers will be left on the board and their product is unique.

c) only one number will be left on the board and it is unique.

d) only one number will be left on the board but it will depend upon the order in which the operations are performed.

After 1 operation, the number of integers decreases by 1. And, in that manner, after n operations there will be $2000 - n$ numbers. After 1998 operations there are exactly two integers, whose product is always 2000!. Choice (B)

Q20. DIRECTIONS *for questions 19 to 23:* Select the correct alternative from the given choices.

If $a \psi b = (a - b)(a^3 + b^3)$, then find the value of $(11) \psi (-11)$.

a) 0

b) 2662

c) – 6655

d) 58564

$a \Psi b = (a - b)(a^3 + b^3)$
$(11) \Psi (-11) = (11 - (-11))(11^3 + (-11)^3) = 0,$
since $(-11)^3 = -11^3$. Choice (A)

Q21. DIRECTIONS *for questions 19 to 23:* Select the correct alternative from the given choices.

M and N are two candles, cylindrical in shape and of equal length. M burns out completely in six hours, whereas N burns out completely in ten hours. If both the candles are lit simultaneously, after how many minutes will the length of N be three times that of M?

a) 330

b) 270

c) 300

d) 290

Let the length of N be 3 times the length of M after t hours.
Considering the initial length of both the candles to be L

Length of N remaining after t hours = $L - \frac{L}{10} t$

Length of M remaining after t hours = $L - \frac{L}{6} t$

$$L - \frac{Lt}{10} = 3(L - \frac{Lt}{6})$$

$$\Rightarrow \frac{3}{6} Lt - \frac{Lt}{10} = 2L$$

$$\Rightarrow \frac{3}{6} t - \frac{t}{10} = 2$$

$\Rightarrow t = 5$ hrs = 300 minutes. Choice (C)

Q22. DIRECTIONS *for questions 19 to 23:* Select the correct alternative from the given choices.
Two persons, A and B, are approaching the foot of a tower, from opposite directions, at same speeds. If at a certain point of time, the angles of elevation of the top of the tower as seen by A and B are 60° and 30° respectively, and A took 15 minutes from that moment to reach the foot of the tower, then after how much more time (in minutes) will B do the same?

a) 15

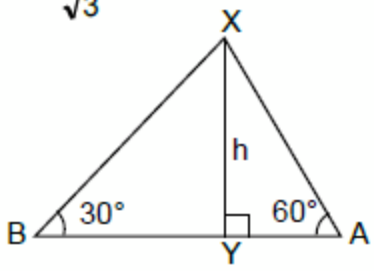
b) 30

c) 45

d) 60

Let the height of the tower (YX) be h.

$\therefore$ AY = $\frac{h}{\sqrt{3}}$ and BY = $h\sqrt{3}$.



Since A and B are travelling at the same speed, in the time A covered $\frac{h}{\sqrt{3}}$ to reach Y,

B will also cover $\frac{h}{\sqrt{3}}$

Remaining distance to be covered by

B = $h\sqrt{3} - \frac{h}{\sqrt{3}} = \frac{2h}{\sqrt{3}}$.

B will cover the remaining distance in another 15 × 2 = 30 minutes. Choice (B)

Q23. DIRECTIONS *for questions 19 to 23:* Select the correct alternative from the given choices.

If a number 'x' is chosen at random from the set of integers from 1 to 100, then the probability that $x + \frac{50}{x+1} < 50$ is

a) $\frac{12}{25}$

b) $\frac{49}{100}$

c) $\frac{1}{2}$

d) $\frac{47}{100}$

By observation, only the integers {1, 2, 3, …., 48} satisfy the condition $x + \frac{50}{x+1} < 50$

$\therefore$ Required probability = $\frac{48}{100} = \frac{12}{25}$

Alternative Solution:

$x + \frac{50}{x+1} < 50$

$\therefore x(x + 1) + 50 < 50(x + 1)$

$\therefore x^2 < 49n$

$\therefore x < 49.$

From 1 to 100 (100 numbers), only 1 to 48 (48 numbers) satisfy this condition.

$\therefore$ Required probability = $\frac{48}{100} = \frac{12}{25}$ Choice (A)

Q24. DIRECTIONS *for question 24:* Type in your answer in the input box provided below the question.

For making an alloy, three metals, lead, zinc and iron, are to be mixed in the ratio of 2 : 3 : 5 respectively. What is the maximum quantity of alloy that can be made with 6 kg lead, 10 kg zinc and 14 kg iron?

The availability of lead, zinc and iron is 6 kg, 10 kg, and 14 kg, respectively, while the required ratio for forming the alloy is 2:3:5.
In order to make the maximum possible alloy, we need to identify the metal which will be the limiting factor. This will be the metal with the least ratio of availability to requirement. The ratio for lead, zinc and iron will be 6/2, 10/3 and 14/5 respectively. The ratio is the least for iron, and therefore we can use all of the iron available without any of the other two metals falling short. Since 5 kg of iron is sufficient to form 2 + 3 + 5 = 10 kg of alloy, 14 kg of iron will be sufficient to form 14 ×10/5 = 28 kg of alloy.
Hence, the maximum quantity of alloy that can be prepared is 28 kg.

Ans: (28)

Q25. DIRECTIONS *for question 25:* Select the correct alternative from the given choices.

In a triangle ABC, let AD, BE and CF be the medians to BC, CA and AB respectively and let G be the point of intersection of the medians. If the quadrilaterals AFGE, BFGD and CDGE are represented as Q_1, Q_2 and Q_3 respectively, then which of the following statements is/are true?

I. If Q_3 is concyclic, then AE $\sqrt{3}$ GD.

II. If Q_1, Q_2 and Q_3 are all concyclic, then triangle ABC is right-angled.

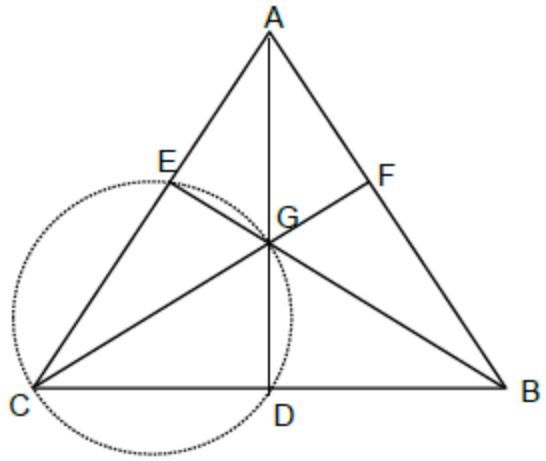
III. If Q_1, Q_2 and Q_3 are all concyclic, then triangle ABC is equilateral.

a) I and II only

b) I and III only

c) Only III

d) Only I



Consider the cyclic quadrilateral EGDC, AC and AD are secants from the same point to the circle.
$\Rightarrow$ AE. AC = AG. AD
AE = EC = x, say.
And AG = 2GD = 2y, say.
(Since E is mid point of AC, while G is centroid and AD is the median).
Hence x. $2x = 2y$. $3y \Rightarrow x = \sqrt{3}\ y \Rightarrow$ AE = $\sqrt{3}$ GD
$\Rightarrow$ I is true.

Similarly, if Q_1, Q_2 and Q_3 are all concyclic, then AE = $\sqrt{3}$ GD $\Rightarrow$ AD = $\frac{\sqrt{3}}{2}$ AC and

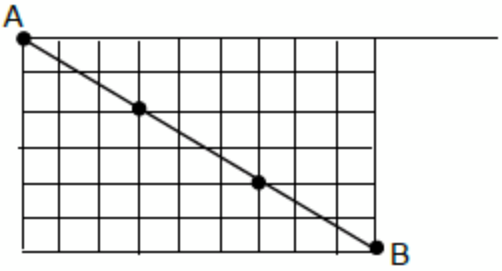
AD = $\frac{\sqrt{3}}{2}$ AB

$\Rightarrow$ AB = AC. Similarly AC = BC can be proved. (i.e., ABC is equilateral). Hence, III is true.
$\Rightarrow$ Only I and III are true. Choice (B)

Q26. DIRECTIONS *for questions 26 and 27:* Type in your answer in the input box provided below the question.

A grid of lines comprises 21 equidistant lines parallel to the *x* axis and 31 equidistant lines parallel to the *y* axis. A straight line is now drawn from one corner of the grid to the diagonally opposite corner. At how many distinct points does the diagonal line intersect the lines in the grid?

In a grid of m parallel lines intersecting n parallel lines, the diagonal will intersect each of the (m + n) lines once. However, whenever the i^{th} line and j^{th} line intersect, for $\frac{i-1}{j-1} = \frac{m-1}{n-1}$, the diagonal will intersect them at a common point. These instances need to be subtracted from (m + n).



Consider the above illustration:

Let us draw 10 lines parallel to y axis and 7 lines parallel to *x* axis, such that now row wise we have 9 cells and column wise we have 6 cells. The diagonal line will intersect every vertical line and every horizontal line once except a few points where two lines in the grid intersect. In the above case we get 10 + 7 – 4 points. We subtract 4 for $\frac{9}{6} = \frac{6}{4} = \frac{3}{2}$ i.e., the grid formed by taking m cells row wise and n cells column wise, where $\frac{m}{n} = \frac{3}{2}$, in addition to the point A.

In the given grid we will have (21 + 31 – 11) = 41 points

$$\left[\frac{30}{20}=\frac{27}{18}=\frac{24}{16}=\frac{21}{14}=\frac{18}{12}=\frac{15}{10}=\frac{12}{8}=\frac{9}{6}=\frac{6}{4}=\frac{3}{2}\right]$$

Hence we get 10 points in addition to point A.

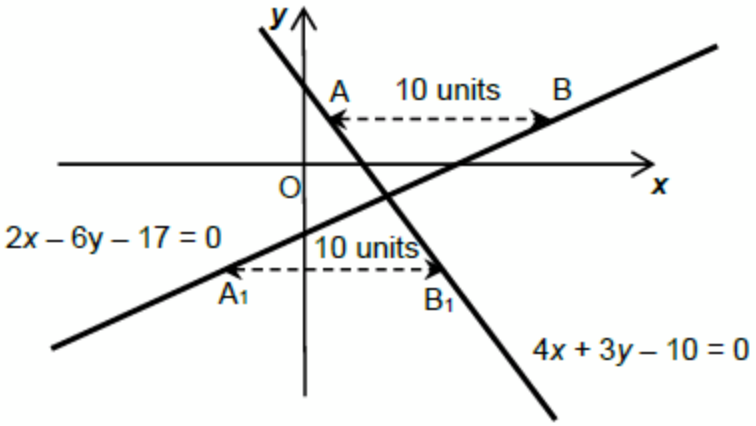
Ans: (41)

Q27. DIRECTIONS *for questions 26 and 27:* Type in your answer in the input box provided below the question.

How many line segments, each of length 10 units, lie in the co-ordinate plane, such that they are parallel to the *x*-axis, with both their endpoints satisfying the equation $(4x + 3y – 10)(2x – 6y – 17) = 0$?

The locus of points satisfying $(4x + 3y – 10)(2x – 6y – 17) = 0$ is nothing but the two straight lines represented by the individual factors of the product on the LHS of the equation above, i.e., $4x + 3y – 10 = 0$ and $2x – 6y – 17 = 0$. We can see that neither of the two lines is parallel to the x-axis nor are the two lines parallel to each other. Since they intersect, it can be easily observed that there will be two pairs of points (in each pair, taking one point on each line, as shown in the figure below)which are exactly 10 units apart and when joined will form a line segment parallel to the x-axis.

In the below figure, A and B are one pair of points (above the point of intersection of the two lines) and A_1 and B_1 are another pair of points (below the point of intersection), such that both pairs are 10 units apart and form line segments that are parallel to the x-axis when joined together.



There will be no other pairs of points possible which will satisfy both the criteria (of length 10 cm and being parallel to x-axis), since keeping $\overline{AB}$ (or $\overline{A_1B_1}$) parallel to x-axis and moving it vertically upwards or downwards will automatically increase or decrease the length of the line segment. Ans: (2)

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

If $2a_n = a_{n-1} + a_{n+1}$, $a_8 = 46$ and $a_5 = 28$, then which of the following is true?

a) $a_{11} = 62$

b) $a_{10} = 58$

c) $a_9 = 54$

d) $a_7 = 42$

We observe that, it is an AP series
$a_8 = a+7d = 46$ and
$a_5 = a+4d = 28$
solving, we get $d = 6$ and $a = 4$
$\therefore a_{10} = 4+9(6) = 58$ Choice (B)

Q29. DIRECTIONS *for question 29:* Type in your answer in the input box provided below the question.
If $4x + 3y - 2z = 10$ and x, y and z are distinct positive integers less than 10, what is the maximum value that x can assume?

If x is to be maximum, y is to be minimum and z can be maximum. Also, the minimum possible value of y is 2 (since 4x and 2z are even and 3y should also be even if the equation is to be even).
For z = 9 and y = 2, x will be 5.5. This is not possible.
For z = 8 and y = 2, x will be 5. This is the maximum possible value of x.
Ans: (5)

Q30. DIRECTIONS *for questions 30 and 31:* Select the correct alternative from the given choices.
Find the maximum distance between any two points lying in the area enclosed by the graph of $|y| = 10\sqrt{2} - |x|$.

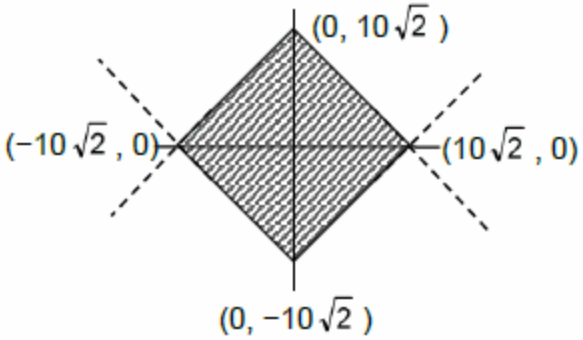
a) $5\sqrt{2}$

b) $10\sqrt{2}$

c) 20

d) $20\sqrt{2}$

The area enclosed by the graph, when plotted, will be as follows:



The maximum distance between any two points lying in this area will be the distance between the extremities of any diagonal, i.e., $2 \times 10\sqrt{2} = 20\sqrt{2}$. Choice (D)

Q31. DIRECTIONS *for questions 30 and 31:* Select the correct alternative from the given choices.
If the LCM of two distinct double-digit numbers, *a* and *b*, is divisible by 12, what is the maximum possible value of the product *ab*?

a) 9504

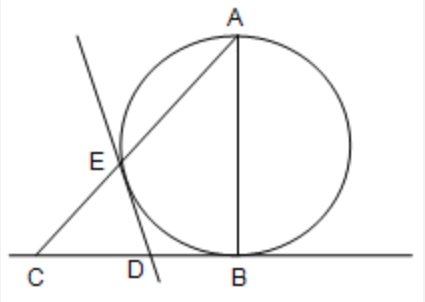
b) 9696

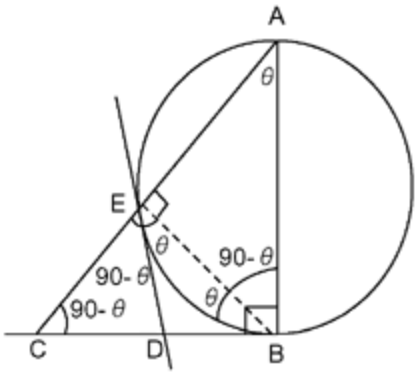
c) 9732

d) 9312

If *ab* is to be maximum, *a* and *b* should be the maximum possible. Working backwards, starting from 99 (the largest two-digit no.), we find that the maximum possible values can be 99 and 96. Hence, the answer is 99 × 96 = 9504. The next highest combination is 98 and 96, the product of which will definitely be lower than 9504. Choice (A)

Q32. DIRECTIONS *for question 32:* Type in your answer in the input box provided below the question.
In the figure given below, AB is the diameter of the circle and BC is tangent to the circle. If CA intersects the circle at E and the tangent to the circle at E intersects BC at D, find the measure of ED (in cm), given that BC measures 16 cm.





As BC is a tangent, $\angle ABC = 90^0$
We join BE
Now $\angle AEB = 90^0$ (Angle in a semi circle)
Let $\angle BAE = \theta$
$\therefore \angle DBE = \angle DEB = \theta$
[$\because$ DB and DE are tangents to the same circle and $\angle DEB$ and $\angle BAE$ are angles in alternate segments]
Thus, DB = DE
$\therefore \angle DEC = 90 - \theta$ [$\because \angle BEC = 90$]
Again, in ΔABC, $\angle ECD = 90 - \theta$
$\therefore \angle DEC = \angle ECD = 90 - \theta$
$\therefore$ DC = ED
$\therefore$ DC = DB = $\frac{1}{2}$ (BC) = 8
$\therefore$ DE = 8 cm.

Alternative Solution:

In order to try and simplify the problem, we could move point C (to the left) to a place (on BC) such that E is then the midpoint of arc AEB. Then ED will be parallel to AB and both ΔCDE and ΔABC will be right angled isosceles triangles.

Now it can easily be observed that ED = $\frac{1}{2}$AB = $\frac{1}{2}$BC = 8 cm. Ans: (8)

Q33. DIRECTIONS *for questions 33 and 34:* Select the correct alternative from the given choices.

In the octal number system, if the ratio of a two-digit number to the number formed by reversing its digits is 4 : 5, find the sum of the two numbers, when expressed in the decimal system.

a) 77

b) 63

c) 81

d) 55

Let the numbers in octal system be $8x + y$ and $8y + x$.

Given that $\frac{8x + y}{8y + x} = \frac{4}{5}$

$\Rightarrow \frac{x}{y} = \frac{27}{36} = \frac{3}{4}$.

Hence, x and y can only be 3 and 4, because for higher multiples of 4 the number cannot be in octal system.

$\therefore$The numbers are $(34)_8$ and $(43)_8$ and their sum = $(77)_8$

Sum of the two numbers in decimal system = $7 \times 8 + 7 = 63$ Choice (B)

Q34. DIRECTIONS *for questions 33 and 34:* Select the correct alternative from the given choices.

Find the range of x, if $\frac{1}{x-2} > \frac{1}{2x}$.

a) (0, 2)

b) (–1, 5)

c) (–1, 0) ∪ (3, ∞)

d) (–2, 0) ∪ (2, ∞)

$$\frac{1}{x-2} > \frac{1}{2x}$$

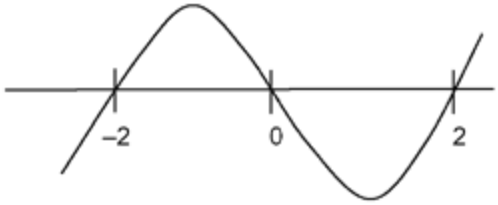
$$\Rightarrow \frac{1}{x-2} - \frac{1}{2x} > 0$$

$$\frac{2x-x+2}{(x-2)2x} > 0$$

$$\Rightarrow \frac{x+2}{x(x-2)} > 0$$

Multiplying both Numerator and Denominator by $x\,(x-2)$, we get $\frac{(x+2)(x)(x-2)}{x^2(x-2)^2} > 0$.

The denominator is a positive quantity and so it can be ignored.
$\therefore (x+2)\,(x)\,(x-2) > 0$.



Therefore the solution for the above inequality is
$-2 < x < 0$ or $x > 2$
i.e., $x \in (-2, 0) \cup (2, \infty)$

Alternative Solution:

Let's assume n = 1

$\therefore \frac{1}{x-2} = -1$ and $\frac{1}{2x} = \frac{1}{2} \Rightarrow \frac{1}{x-2} < \frac{1}{2x}$

$\therefore$ Option (A) and (B) don't satisfy the given condition.
Assuming x = 3, we get

$\frac{1}{x-2} = 1$ and $\frac{1}{2x} = \frac{1}{6} \Rightarrow \frac{1}{x-2} < \frac{1}{2x}$.

$\therefore$ The only choice satisfying this is (D). Choice (D)

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