DASH CAT 3

DASH CAT 3

Instructions

The passage below is accompanied by a set of questions. Choose the best answer to each question.

Western philosophers have not, on the whole, regarded Buddhist thought with much enthusiasm. As a colleague once said to me: 'It's all just mysticism.' This attitude is due, in part, to ignorance. But it is also due to incomprehension. When Western philosophers look East, they find things they do not understand - not least the fact that the Asian traditions seem to accept, and even endorse, contradictions. Thus we find the great second-century Buddhist philosopher Nagarjuna saying: "The nature of things is to have no nature; it is their non-nature that is their nature. For they have only one nature: no-nature."

An abhorrence of contradiction has been high orthodoxy in the West for more than 2,000 years. Statements such as Nagarjuna's are therefore wont to produce looks of blank incomprehension, or worse. As Avicenna, the father of Medieval Aristotelianism, declared: "Anyone who denies the law of non-contradiction should be beaten and burned until he admits that to be beaten is not the same as not to be beaten, and to be burned is not the same as not to be burned."

One can hear similar sentiments, expressed with comparable ferocity, in many faculty common rooms today. Yet Western philosophers are slowly learning to outgrow their parochialism. And help is coming from a most unexpected direction: modern mathematical logic, not a field that is renowned for its tolerance of obscurity.

Let's start by turning back the clock. It is India in the fifth century BCE, the age of the historical Buddha, and a rather peculiar principle of reasoning appears to be in general use. This principle is called the catuskoti, meaning 'four corners'. It insists that there are four possibilities regarding any statement: it might be true (and true only), false (and false only), both true and false, or neither true nor false.

We know that the catuskoti was in the air because of certain questions that people asked the Buddha, in exchanges that come down to us in the sutras. Questions such as: what happens to enlightened people after they die? It was commonly assumed that an unenlightened person would keep being reborn, but the whole point of enlightenment was to get out of this vicious circle. And then what? Did you exist, not, both or neither? The Buddha's disciples clearly expected him to endorse one and only one of these possibilities. This, it appears, was just how people thought.

At around the same time, 5,000km to the west in Ancient Athens, Aristotle was laying the foundations of Western logic along very different lines. Among his innovations were two singularly important rules. One of them was the Principle of Excluded Middle (PEM), which says that every claim must be either true or false with no other options (the Latin name for this rule, tertium non datur, means literally 'a third is not given'). The other rule was the Principle of Non-Contradiction (PNC): nothing can be both true and false at the same time [...] Aristotle succeeded in locking the PEM and the PNC into Western orthodoxy, where they have remained ever since.

1. Why does the author cite Avicenna?

A. To showcase the extreme stance Avicenna promoted against those in the East who endorsed contradictions.

B. To emphasize the need to decry contradictions as per Western orthodoxy.

C. To highlight the ferocity with which Western philosophers opposed contradictions.

D. To showcase Avicenna's firm belief in the law of non-contradiction.

Sol. "*An abhorrence of contradiction has been high orthodoxy in the West for more than 2,000 years...One can hear similar sentiments, expressed with comparable ferocity, in many faculty common rooms today.*"
The author cites Avicenna to highlight the degree of opposition that contradictions faced. It also showcases how this opposition has persisted in Western philosophy. Option C correctly captures this without distorting the message.
Options B and D misinterpret the author's intention. Option A is not presented in the passage and is distorted.
Hence, Option C is the correct choice.

2. The possible origin of catuskoti can be best attributed to

A. the discourse between the Buddha and common masses on existence after attaining enlightenment.

B. the questions asked by the Buddha to his disciples regarding the nature of enlightenment.

C. the teachings in the sutras that claimed the existence and non-existence of the soul after attaining enlightenment.

D. the scholars in ancient India who extended the Buddha's reasonings to general use.

Sol. The answer to this question has been clearly stated in the passage: "*We know that the catuskoti was in the air because of certain questions that people asked the Buddha, in exchanges that come down to us in the sutras. Questions such as: what happens to enlightened people after they die? It was commonly assumed that an unenlightened person would keep being reborn, but the whole point of enlightenment was to get out of this vicious circle. And then what? Did you exist, not, both or neither?*" Option A aptly presents this.
Options C, B and D are not implied or stated in the passage.
Hence, Option A is the correct choice.

3. The third paragraph

A. portrays the scholarly antagonism that contradictions face even today.

B. highlights the shift in perspective among Western scholars on the subject of contradictions.

C. emphasises how modern mathematical logic, given its intolerance of obscurity, has been instrumental in countering contradictions.

D. inform how Western scholars are gaining ground in their conflict against contradictions.

Sol. "*One can hear similar sentiments, expressed with comparable ferocity, in many faculty common rooms today. Yet Western philosophers are slowly learning to outgrow their parochialism. And help is coming from a most unexpected direction: modern mathematical logic, not a field that is renowned for its tolerance of obscurity.*"
The author begins the third paragraph by pointing out how the hostility towards contradictions still persists today. However, he adds that this attitude is changing: Western philosophers are becoming less narrow-minded. He further states how modern mathematical logic surprisingly is helping bring about this transformation in perspective. Option B correctly interprets the message.
Although Option A is true, the focus is on shifting attitudes. Hence, the statement here misses out on the crux of the third paragraph.
We notice that Option C is contrary to the point presented in the third paragraph, and hence, we can reject it.
Option D has not been implied in the passage, and thus, we can eliminate it.
Hence, Option B is the correct choice.

4. How did catuskoti conceptually differ from Aristotelian logic?
A. The catuskoti had four core principles while Aristotelian logic had many.

B. Aristotelian logic is at the epicentre of Western philosophy, while catuskoti, due to its inherent contradictions, is rebuffed.

C. Catuskoti was all-encompassing in that even Aristoliean principles came under its banner.

D. The third and the fourth possibility stated in the catuskoti did not have a place in Aristotelian logic.

Sol. Catuskoti - "*This principle is called the catuskoti, meaning 'four corners'. It insists that there are four possibilities regarding any statement: it might be true (and true only), false (and false only), both true and false, or neither true nor false.*"
Aristotelian logic - "*Aristotle was laying the foundations of Western logic along very different lines. Among his innovations were two singularly important rules. One of them was the Principle of Excluded Middle (PEM), which says that every claim must be either true or false with no other options (the Latin name for this rule, tertium non datur, means literally 'a third is not given'). The other rule was the Principle of Non-Contradiction (PNC): nothing can be both true and false at the same time* "
We need to the conceptual difference between the two ideas: it is evident from the above that the contradictory elements presented in the catuskoti are absent in Aristotelian logic. Thus, the third and fourth principles under the catuskoti do not find a mention under Aristotelian logic.
Option D correctly presents this conceptual difference.
Options A, B and C are either irrelevant (not conceptual differences) or not stated.
Hence, Option D is the correct choice.

Instructions

The passage below is accompanied by a set of questions. Choose the best answer to each question.

Bone and muscle, partners in movement, have long been known to interact physically. Muscles tug on bone, and as muscles get stronger and larger, bone responds to this increased physical pull by becoming bigger and stronger too. That allows the bone to adapt to an animal's physical needs, so the proportional muscle and bone can continue to work together effectively. But it turns out that there's also a chemical conversation going on. For example, skeletal muscle cells make a protein called myostatin that keeps them from growing too large. In experiments with rodents, alongside observations of people, researchers have found that myostatin also keeps bone mass in check.

During exercise, muscles also make a molecule called beta-aminoisobutyric acid (BAIBA) that influences fat and insulin responses to the increased energy use. Bonewald has found that BAIBA protects osteocytes from dangerous byproducts of cellular metabolism called reactive oxygen species. In young mice that were immobilized — which normally causes atrophy of bone and muscle — providing extra BAIBA kept both bones and muscle healthy. In additional studies, Bonewald and colleagues found that another muscle molecule that increases with exercise, irisin, also helps osteocytes to stay alive in culture and promotes bone remodeling in intact animals. The conversation isn't all one-way, either. In return, osteocytes make prostaglandin E2, which promotes muscle growth, on a regular basis. They boost production of this molecular messenger when they experience an increase in the tug from working muscles.

The human body contains about as many microbial cells as human ones, and the trillions of bacteria and other microorganisms inhabiting the gut — its microbiome — function almost like another organ. They help to digest food and prevent bad bacteria from taking hold — and they talk to other organs, including bone. So far, the bone-microbiome conversation seems to be one-way; no one has observed bone sending messages back to the microbes, says Christopher Hernandez, a biomechanics expert at Cornell University in Ithaca, New York. But the skeleton can learn a lot of useful things from the gut, McCabe says. For example, suppose a person gets a nasty case of food poisoning. They need all their resources to fight off the infection. "It's not the time to build bone," says McCabe.

The first hints of a bone-microbiome connection came from a 2012 study of mice raised in a sterile environment, without any microbes at all. These animals had fewer bone-destroying osteoclasts, and thus higher bone mass. Giving the mice a full complement of gut microbes restored bone mass to normal, in the short term. But the long-term effects were a bit different. The microbes released molecules called short-chain fatty acids that caused the liver and fat cells to make more of a growth factor called IGF-1, which promoted bone growth.

Gut microbes also appear to moderate another signal that affects bone: parathyroid hormone (PTH), from the parathyroid glands at the base of the neck. PTH regulates both bone production and breakdown. But PTH can only promote bone growth if mice have a gut full of microbes. Specifically, the microbes make a short-chain fatty acid called butyrate that facilitates this particular conversation.

5. Which of the following is a valid conclusion that can be drawn from the passage?
A. High muscular development in a person indicates that the myostatin in their body is not properly regulated.

B. Without the tug of the muscles on the bones, there would be minimal bone growth.

C. The microbiome sends signals to the bone which influence bone growth.

D. It is impossible to achieve growth in muscles or bones if the body does not produce certain necessary chemicals.

Sol. A: *For example, skeletal muscle cells make a protein called myostatin that keeps them from growing too large.*
High muscular development does not mean that there is a chemical imbalance in the body. Myostatin checks the muscles from becoming too large. High muscular development is not equivalent to being 'too large'. Hence, Option A can be eliminated.
B: The author has clearly mentioned that aside from physical interaction between the two, there is also a chemical interaction. Since we cannot say whether the effect of this chemical interaction will be considerable or minimal in a body, Option B cannot be concluded.
C: *The statement here is a valid conclusion based on the information provided in the last two paragraphs: {The microbes released molecules called short-chain fatty acids that caused the liver and fat cells to make more of a growth factor called IGF-1, which promoted bone growth.}*
Also from *{ and they talk to other organs, including bone. So far, the bone-microbiome conversation seems to be one-way; no one has observed bone sending messages back to the microbes, says Christopher Hernandez, a biomechanics expert at Cornell University in Ithaca, New York. But the skeleton can learn a lot of useful things from the gut, McCabe says. For example, suppose a person gets a nasty case of food poisoning. They need all their resources to fight off the infection. "It's not the time to build bone," says McCabe.}*
D: Since physical interaction also plays a role, we cannot say that growth cannot be achieved without chemical production that aids the growth. Hence, Option D can be eliminated too.

6. Which of the following is a valid inference that can be drawn from the passage?
A. Physical activity promotes muscular development only if ample nutrients are provided to the body.

B. BAIBA ensures that the increased energy demand in the body is taken care of by burning stored fat.

C. Withering away of osteocytes would result in bone weakness as well as muscle atrophy.

D. Exercise primarily stimulates muscles but also results in bone growth due to chemical interaction.

Sol. A: Though true in a general sense, the fact has not been hinted at in the passage anywhere. Hence, Option A cannot be inferred from the passage.
B: *During exercise, muscles also make a molecule called beta-aminoisobutyric acid (BAIBA) that influences fat and insulin responses to the increased energy use.*
It has been mentioned that BAIBA influences fat and insulin response to the energy deficit in the body. However, the effect itself has not been mentioned. It is possible that BAIBA promotes fat preservation and breaks down other molecules to supply the required energy. Option B cannot be inferred.
C: The necessity of osteocytes for bones and muscles has not been mentioned in the passage anywhere. Hence, Option C cannot be inferred either.
D: *During exercise, muscles also make a molecule called beta-aminoisobutyric acid (BAIBA) that influences fat and insulin responses to the increased energy use.*

In additional studies, Bonewald and colleagues found that another muscle molecule that increases with exercise, irisin, also helps osteocytes to stay alive in culture and promotes bone remodeling in intact animals.
Paragraph 2 is concerned with showing how there is a two way interaction between muscles and bones. The author first mentions exercise as a stimulant to the muscles, that indirectly affects the bones. Hence, Option D can be inferred, and is the correct answer.

7. The microbiome affects the human body in all of the following ways EXCEPT:
A. It impacts liver functioning and the storage of fat in the body.

B. It moderates bone growth and breakdown in the body.

C. It fends off bad bacteria that could pose a problem to the body.

D. It interacts with other organs and the skeleton, ensuring smooth functioning.

Sol. A: {*The microbes released molecules called short-chain fatty acids that caused the liver and fat cells to make more of a growth factor called IGF-1, which promoted bone growth.*} The microbiome does not affect fat storage itself but uses the fat cells to produce another growth factor. Hence, Option A is not a function of the microbiome and is the answer.
B: {*Gut microbes also appear to moderate another signal that affects bone: parathyroid hormone (PTH), from the parathyroid glands at the base of the neck. PTH regulates both bone production and breakdown.*} From the above line, Option B can be inferred as a function.
{*They help to digest food and prevent bad bacteria from taking hold — and they talk to other organs, including bone.*} From the above line, Options C and D can be inferred. Hence, they both can be eliminated too.

8. Which of the following would weaken the causation between the presence of microbiome and the functioning of PTH mentioned in the passage?
A. A culture of bacteria, essential for the sustenance of the microbiome, can impede bone growth in certain organisms.

B. An inability to sustain a healthy gut microbiome indicates that the body is not receptive to growth hormones.

C. The anatomical structure of rats on which the PTH study was conducted is quite different from that of humans.

D. Artificially created gut microbiomes in rats that did not have a natural microbiome resulted in increased bone growth.

Sol. *Gut microbes also appear to moderate another signal that affects bone: parathyroid hormone (PTH), from the parathyroid glands at the base of the neck.*
The causation that the author mentions in the passage is that gut microbes moderate the PTH. The experiment showed that PTH would result in growth only if a gut microbiome was present. To weaken this causation, we need to show that these are correlated, but not causal.
A: Option A says that the microbiome can also result in an impediment to growth. The author has not touched upon whether there is a flip side to the growth caused by the bacteria, but that the bacteria is necessary for PTH functioning. Since this does not weaken the causation in any way, Option A can be eliminated.

B: Option B says that there is an underlying factor that affects both the microbiome and the PTH functioning. Thus, this weakens the causation, since the microbiome is not causing PTH function, but both are being affected by some other underlying malfunction in the body. Thus, Option B is the correct answer.
C: The difference in anatomical structures does not considerably weaken the causation, since the way chemicals function in the body could be the same. Moreover, the author is not talking about humans specifically. If the causation is true for any organism, it supports the author's contention. Hence, Option C can be eliminated too.
D: Option D actually strengthens the author's contention. If creating a microbiome artificially leads to increased growth, the causation is strengthened. Thus, Option D can be eliminated too.

Instructions

The passage below is accompanied by a set of questions. Choose the best answer to each question.

Many of us assume that flourishing in the face of adversity requires a certain kind of mindset. Believing in your power, staying focused on future goals, being proactive, and leveraging social relationships are four outlooks that can help, many of us suspect, in overcoming life's obstacles. Driven by the belief that people can change their lives by thinking differently, public organisations in the UK and the US have made a deliberate effort over the past decade to develop such a mindset among people experiencing the most persistent forms of adversity in advanced democracies: those who live on little or no income. Yet such efforts have been largely unsuccessful at reducing poverty and unemployment, and have been derided both by the people they were designed to help and by those advocating on their behalf. What has gone wrong here?

Many explanations have emerged from those studying poverty, with each account more nuanced and humanistic than the last [...] More recently, research has focused on the psychological costs of poverty itself: thinking daily about financial worries eats up cognitive 'bandwidth', leaving little mental space for someone to figure out how to advance their long-term goals - let alone stick to them. That's why the latest set of interventions focus either on nudging poor people toward more acceptable behaviours, such as preparing healthier meals and saving money, or training them in cognitive skills that enable them to do these things more regularly.

Despite decades of explanations and interventions, these efforts have fallen short in one important way: what I call the assumption of free-floating mindsets [...] It runs like this: everyone has the power to decide how to perceive and respond to the unavoidable constraints and challenges they face. How did such a belief become commonplace? The assumption arises from evidence that some perceptions and responses are more helpful than others, and these have earned specific names in psychology: believing in one's own power reflects what researchers call an internal 'locus of control'; sticking to long-term plans engages 'self-regulation'; being positively proactive in moving toward one's goals is called 'approach orientation'; and leveraging relationships involves the development of 'general social trust' and 'agreeableness'. Research teaches us that these are associated with better psychological functioning, higher incomes, and longer lives. When combined, these orientations appear to converge into a mindset that can lead to human flourishing.

There's one problem: mindsets are not free-floating. They are neither optional strategies that everyone can freely adopt nor value-neutral ways of enhancing wellbeing. Instead, they are

embedded in life conditions that have material, social and ideological dimensions, and this is just as true for those of us living in poverty as it is for the rest of us living in financial comfort.

As a social psychologist, I study how contexts shape the way we think, such that what appears to be a free-floating mindset is actually the product of societal forces working in subtle ways [...] The first strand involves understanding how behaviour is a response to ecological cues: how does a person with a set of fundamental needs navigate an environment filled with threats, opportunities and constraints? For those who are poor or living on a very low income, one of the most salient aspects of one's environment is scarcity: simply not having enough money to meet one's daily needs.

9. As per the passage, all of the following are potential examples of modern interventions to deal with poverty EXCEPT:
A. An NGO organising programs nationwide that train the homeless in basic financing and income generation methodologies.

B. A government initiative providing weekly provisions to families below the state-determined poverty threshold along with free education at state-run institutions.

C. A non-profit supporting unemployed youth from economically-backwards families by teaching them to save money periodically and focus on long-term personal and financial goals.

D. A nutritional program by the civic authorities in a financially-strained neighbourhood teaching the members to cook healthy meals economically.

Sol. The author discusses the forms of current interventions in the second paragraph: "*More recently, research has focused on the psychological costs of poverty itself: thinking daily about financial worries eats up cognitive 'bandwidth', leaving little mental space for someone to figure out how to advance their long-term goals - let alone stick to them. That's why the latest set of interventions* ***focus either on nudging poor people toward more acceptable behaviours****, such as preparing healthier meals and saving money, or* ***training them in cognitive skills that enable them to do these things more regularly***."
The author focuses on how recent interventions focus on mindset change instead of actual help to those suffering from poverty. Hence, the options which indicate focus on mindset change would be in line with the modern interventions.
We need to assess the options based on the above information: (i) ***nudging poor people toward more acceptable behaviours*** and (ii) ***training them in cognitive skills***
Option A: This endeavour involves point (ii)
Option B: This program does not touch upon points (i) or (ii)
Option C: This effort incorporates points (i) or (ii) or both
Option D: This initiative also focuses on point (i)
Hence, the odd one out here is Option B which provides actual help to those suffering from poverty.

10. Which of the following is closest to the idea conveyed in the first paragraph?
A. Efforts by public organisations in the UK and the US to alleviate poverty and unemployment have gone awry, with most advocates censuring the programs.

B. Believing in one's power, staying focused on future goals, being proactive, and leveraging social relationships are essential outlooks that can help overcome life's obstacles.

C. Decade-long efforts to tackle poverty and unemployment by fostering an adversity-resilient mindset have been fruitless and perceived negatively by the target group.

D. The disproportionate focus on improving the mindset of the poor and the unemployed without any real financial support has created a poor opinion of government efforts in the UK and the US.

Sol. The author presents a common belief prevalent today: "*Believing in your power, staying focused on future goals, being proactive, and leveraging social relationships are four outlooks that can help, many of us suspect, in overcoming life's obstacles.*"
He adds that most interventions undertaken by the UK and US public organisations have directed efforts based on this belief. However, such campaigns have been "largely unsuccessful" and faced backlash from the target group. In the subsequent paragraphs, the author tries to present the reason as to why this has been the case. Option C aptly captures the key points comprising the belief, the efforts by public authorities and the outcome.
Option A is vague and captures partial information. Option B merely reiterates the common belief without highlighting its relevance. Option D is not implied in the passage.
Hence, Option C is the correct choice.

11. According to the author, the assumption of a free-floating mindset can be best summed up as:
A. Individuals lack power in the face of adversity, causing turmoil in their internal 'locus of control'.

B. Individual mindsets are neither optional strategies that everyone can freely adopt nor value-neutral ways of enhancing wellbeing.

C. Individuals in control of their cognitive faculties during uncertainties have better psychological functioning, higher incomes, and longer lives.

D. Individuals are in control of their decisions and responses in the face of adversities and uncertain times.

Sol. The author spells out the assumption in the third paragraph: "*Despite decades of explanations and interventions, these efforts have fallen short in one important way: what I call the assumption of free-floating mindsets [...] It runs like this: everyone has the power to decide how to perceive and respond to the unavoidable constraints and challenges they face.*" Option D comes closest to summarising this assumption.
Options A, B and C are not implied or presented as assumptions in the passage.
Hence, Option D is the correct choice.

12. None of the following has been stated in the passage EXCEPT:
A. Our mindset varies with context, which is - in turn - dependent on material, social and ideological constraints.

B. The scarcity of resources impinges on our ability to think positively during adverse times.

C. Earlier interventions in combatting poverty were unsuccessful since they did not address the psychological cost associated with it.

D. People in the UK do not believe that a positive mindset is practical or essential in living through trying times.

Sol. Option A: The author states the following: "*...mindsets are not free-floating. They are neither optional strategies that everyone can freely adopt nor value-neutral ways of enhancing wellbeing. Instead, they are embedded in living conditions that have material, social and ideological dimensions, and this is just as true for those of us living in poverty as it is for the rest of us living in financial comfort.*" He highlights that mindsets cannot be easily adopted, nor are they value-neutral ways of improving wellbeing; he adds that perspectives vary based on context since they are dependent on the living conditions. These living conditions are further reliant on material, social and ideological factors. The statement here aligns with this portrayal.
Options B and C are not implied in the passage. Option D distorts the author's message in the first paragraph: the author states that the target group finds the efforts to be unwelcome; he does not generalise this or attach it to the common masses.
Hence, Option A is the correct choice.

Instructions

The passage below is accompanied by a set of questions. Choose the best answer to each question

Brixton House theatre offers a model for bettering a place in a way that strives to engage with the people who live there. This is partly enabled by property deals; in this case, it forms part of the Somerleyton Road development, where the London borough of Lambeth hopes to build an enfilade of housing blocks between a railway viaduct and what was, before postwar rebuilding, a handsome, tree-lined, Victorian avenue. Some of the money for the theatre comes from the sale of its former site at the Oval. The core aim of the new building is to provide upgraded facilities, in particular two studio theatres, which can be operated separately or together, offering a wide range of different configurations of stage and seating, with better facilities for lighting and sound and improved accessibility. With capacities of up to 220 and 120 respectively, the two spaces represent only modest increases of the equivalent spaces in the old venue. The object is not empire-building, but to continue to do what Ovalhouse did, only better. The hope is to keep ticket prices low, in the range of £10 to £21.

The aim is to encourage a community of performers and artists closely connected to the part of London in which the theatre sits. Rehearsal and meeting spaces on the upper floors, which make a large part of the building, will be available to groups outside the theatre. Carlton Mansions, an adjoining Victorian block of railway workers' flats, has been converted by another practice, Zac Monro Architects, into affordable workspaces for the creative industries.

The idea, Obisesan has said, is to be "forward-thinking, community-focused and rebelliously outspoken". The history of Brixton, he believes, "is proudly political and its rich blend of cultures will inspire the new theatre to be a cradle for startling stories and extraordinary art". The opening programme includes Tonderai Munyevu's Mugabe, My Dad and Me, a personal

account of the impact of the Zimbabwean dictator on the author's life, and Hussina Raja's Station, which is billed as "an interactive live performance installation set in a traditional south Asian living room".

In all this, the building, by the architects Foster Wilson Size and the contractor Galliford Try, acts as a relatively neutral frame for whatever life the theatre might generate. The architects have gone for a "studio aesthetic", with something of the spirit of Brixton's industrial past. The organisation is straightforward: a bar and foyer with a long glass frontage on to the street, a direct ground-level route to the two auditoria, a central atrium and a staircase around which the upper-floor world of rehearsals will revolve. Animation, apart from the daily living theatre of the building's users, will come from a coloured LED lighting display on the exterior and digital screens. Two vigorous works of art stand in contrast to the sober architecture. One is Nuclear Dawn, a mural painted in the wake of the 1981 Brixton riot, painted the full height of the sidewall of Carlton Mansions, a document of the fears of the time in which a giant skeleton, clad in the flags of the atomic powers, scatters missiles across a London sky. This has been restored and the new building respectfully cuts back to make a little plaza in front of it.

13. What can be inferred as the core purpose with which the new Brixton House theatre is being built?

A. To renovate the old building and upgrade it with better facilities and accessibility.

B. To provide a better theatre experience and improve the lives of the stakeholders.

C. To encourage a new generation of theatre talent and provide them with the required facilities.

D. To add to the economic as well as the cultural prosperity of the nearby region.

Sol. The author does not explicitly mention the purpose why the new theatre building is being made, but we can infer it from the following excerpts:
Brixton House theatre offers a model for bettering a place in a way that strives to engage with the people who live there.
The core aim of the new building is to provide upgraded facilities, in particular two studio theatres, which can be operated separately or together, offering a wide range of different configurations of stage and seating, with better facilities for lighting and sound and improved accessibility.
The aim is to encourage a community of performers and artists closely connected to the part of London in which the theatre sits.
Thus, we can infer that the facilities being provided are for the purpose of improving the theatre experience and improving the lives of the people who are connected to the business. Option B correctly captures this, and hence, is the correct answer.
A: Renovation of the old building is not being done, but a new building is being made. Option A is incorrect.
C: This option misses the crucial aspect of the focus on helping local theatre talent. Option C can be eliminated.
D: Though one of the points mentioned, it cannot be inferred to be the main purpose. Option D can be eliminated too.

14. Which of the following can be inferred about the 'Ovalhouse'?
A. It was an affordable workspace for the creative industries.

B. It has had a role to play in the genesis of the new Brixton House theatre.

C. The overall space in the new and old theatres mentioned is almost the same.

D. It was available to performing groups outside the theatre too.

Sol. A: The affordability of the new theatre has been mentioned in the passage, but nothing has been mentioned about the old theatre. Hence, Option A can be eliminated.
B: *Some of the money for the theatre comes from the sale of its former site at the Oval.*
Since a bit of contribution was made by the Ovalhouse, we can infer that it had a role to play in the genesis of the new theatre. Hence, Option B is the correct answer.
C: The author compared the seating capacities, which are almost the same. However, no comparison has been made between the overall areas of the two theatres. Hence, Option C can be eliminated.
D: This has not been mentioned in the context of the Ovalhouse, but the new theatre. Hence, Option D can be eliminated too.

15. The creators of the Brixton House Theatre will entertain all of the following comments EXCEPT:
A. Coupled with the Carlton Mansions, the Brixton House is bound to spur activity in the local creative industries.

B. It is safe to expect Brixton House to be a fountainhead of progressive, thought-provoking art.

C. The aesthetic design of the Brixton theatre reflects its industrial past and serves as a neutral frame for performing art.

D. With its increased capacities and improved facilities, the creation of Brixton House is primarily an expansion exercise.

Sol. Option A: {*The aim is to encourage a community of performers and artists closely connected to the part of London in which the theatre sits. Rehearsal and meeting spaces on the upper floors, which make a large part of the building, will be available to groups outside the theatre. Carlton Mansions, an adjoining Victorian block of railway workers' flats, has been converted by another practice, Zac Monro Architects, into affordable workspaces for the creative industries*} Based on the discussion in the second paragraph, the creators will agree that these structures will spur activity in the creative industries. Option A can be eliminated.
Option B: The creators of the theatre have explicitly cited their expectations as follows: {*The idea, Obisesan has said, is to be "forward-thinking, community-focused and rebelliously outspoken". The history of Brixton, he believes, "is proudly political and its rich blend of cultures will inspire the new theatre to be a cradle for startling stories and extraordinary art".*} Option B can be eliminated.
Option C: {*In all this, the building, by the architects Foster Wilson Size and the contractor Galliford Try, acts as a relatively neutral frame for whatever life the theatre might generate. The architects have gone for a "studio aesthetic", with something of the spirit of Brixton's*

industrial past. } Given that a positive trait is being highlighted in the statement, the creators are most likely going to agree with this comment.
Option D: {*The object is not empire-building, but to continue to do what Ovalhouse did, only better.*} The creators have specified the reason behind the creation of the Brixton House - a larger agenda is being served. It is not "primarily an expansion exercise" but instead, has another set of motives. The author will not agree with Option D.

16. What is the purpose of the last paragraph of the passage?
A. To demonstrate how the elements in the building are neutral and respectful of Brixton's history.

B. To highlight the facilities being provided at a modest price to lure in performers and artists.

C. To paint a picture of the art and architecture of the new Brixton building.

D. To conclude the passage by divulging the specific details of the Brixton building and its past.

Sol. Throughout the final paragraph, the author describes the art and architecture present in the building to the reader. He describes in vivid detail the different aspects of the new building so that the reader can visualize it. Hence, option C captures the purpose of the paragraph.
A: The author says that the frame, i.e., the building acts neutral in spite of the life it holds. However, he does not relate this neutrality with respect to Brixton's history. Moreover, while some elements of Brixton's history have been incorporated into the design, the passage doesn't imply that the building is respectful of Brixton's history. Hence, option A is out of scope.
B: The author is not only mentioning the facilities but also highlighting the architecture and art that is an important part of the Brixton building. Hence, Option B can be eliminated.
D: The author is not trying to conclude the passage here. The final paragraph ends abruptly, without any ending remarks. Divulging specific details does not provide a proper finish, indicating that the passage is a part of a bigger work. Hence, Option D can be eliminated too.

17. **Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out.**
1. Commerce flourished, including considerable trade with China and Korea.
2. Although ink monochrome painting reached its height in Japan during the Muromachi period, other painting styles also flourished.
3. In spite of the war, Japan's relative economic prosperity, which had begun in the Kamakura period, continued well into the Muromachi period.
4. During the Muromachi period, some of Japan's most representative art forms developed, including ink wash painting, ikebana flower arrangement, the tea ceremony, Japanese gardening, bonsai, and Noh theatre.
5. Though the eighth Ashikaga shogun, Yoshimasa, was an ineffectual political and military leader, he played a critical role in promoting these cultural developments.

Sol. A brief reading of the sentences suggests that the paragraph must be about the various developments that took place in Japan during a period in history. 3 introduces the time period being talked about and mentions economic prosperity. 1 further adds details about the flourishing economy. 45 is a mandatory pair, that highlights the cultural developments that took place during this time.

Though 2 talks about a cultural development during the Muromachi period, it is too specific about a single painting form, and hence, fails to find a fit in the paragraph. Hence, 2 is out of context here.

18. **The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.**
Darwin's best shot at an explanation was that random mutations changed and rearranged genes, altered the structure and function of bodies, and so produced adaptations that allowed certain organisms to thrive and reproduce in their environment. (In technical terms, they are *selected* for by the environment.) In the end, somehow, intelligence was the result. But there's plenty of natural and experimental evidence to suggest that evolution doesn't just select hardwired solutions that are engineered for a specific setting. Evolution, it seems, doesn't come up with answers so much as generate flexible problem-solving agents that can rise to new challenges and figure things out on their own.

A. Darwin's theory about evolution is rejected due to the fact that mutations do not occur randomly but with a specific purpose, as exemplified by experimental evidence.

B. Far from being a selection among random mutations, evolution is the ability of an organism to thrive and reproduce in its environment using flexible solutions.

C. Evolution seems to occur not from a selection from random mutations as Darwin suggested but from adaptation and generation of flexible problem-solving agents.

D. Evolution tries to fix problems on its own using novel solutions instead of relying upon the selection of random mutations to help an organism thrive.

Sol. The main points of the paragraph are:
1. Darwin suggested that evolution takes place by a selection among random mutations which would be the most suitable to survive.
2. Natural and experimental evidence suggest evolution does not select a particular solution for a specific environment but generates flexible problem-solving agents capable of adapting to different challenges.
Option C comes the closest in capturing both these points, and hence, is the correct answer.
A: Darwin's theory is not rejected here. Out of the scope.
B: Distorted definition.
D: Does not mention the flexibility of solutions, which is an important distinguishing factor.

19. **Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.**
1. Most came from California species, like perch and rockfish; about 15 percent of the identified bones belonged to fish found in the South China Sea.
2. Scrutinizing bone size, shape, and other physical features, Kennedy was able to figure out the fish type for more than 3,000 specimens.
3. Kennedy joined the team and was tasked with studying more than 50,000 animal bones, which included 5,759 fish bits.
4. Thus, Chinese fishers dried their catch and sent it, via traders, to America.

Sol. A brief reading of the sentences indicates that the paragraph is about a study of fish bones and the results that came from the study. 3 is an apt opening sentence, which introduces the study and what was being done. 2 follows up by indicating the procedure and what were the results. 1 then delves deep into the results, and explains the various fish types found. 4 then forms a conclusion from the available data about the fish bones. Thus, the correct sequence is 3214.

20. **The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.**
The challenge to the idea of 'greatness' - the challenge to assigning hierarchical value to cultural expressions - isn't as preposterous as it might first appear. If, for example, one points to the aesthetic qualities of a work, one must reckon with the fact that aesthetic quality is notoriously difficult to pin down, and that attempts going back to antiquity have failed to give us an objective standard by which to judge. Moreover, aesthetic judgments can easily boil down to individual preferences, which, though perhaps finely attuned to prevailing social norms, are actually the result of particular kinds of education. In other words, it's hard to extricate aesthetic value from cultural - and aristocratic - prejudice.

A. Judging the aesthetic value of a cultural expression is challenging due to the subjective nature of appreciation.

B. The identification of 'greatness' in culture can be eased by having an objective standard by which to judge.

C. No culture is great or superfluous and the appreciation boils down to a subjective interpretation of the same.

D. The idea of greatness is preposterous as there is no objective standard for judging the aesthetic quality of a cultural expression.

Sol. The main point of the passage is that 'greatness', that is the aesthetic value of a cultural expression, is difficult to define as we lack an objective measure for the same. Hence, Option A is the correct answer.
The author is not trying to say that we need an objective standard, but that we lack one. Option B can be eliminated.
Option C misses out on the part that we lack an objective measure for evaluation. Option C can be eliminated.
Option D is a distortion of what has been mentioned in the passage. Hence, Option D can be eliminated too.

21. **Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.**
1. But emails show that a regulator in oil-rich Texas left a meeting with BlackRock believing the company had undergone a change of heart.
2. The comments were widely seen as a signal that the asset manager, whose clients have entrusted $10tn to its care, would wield its investment clout to support greener ventures.
3. In his annual letter to chief executives, BlackRock boss Larry Fink said that pursuing climate action policies was not about being "woke" but was about pursuing profits on behalf of clients.

4. Emails have revealed the high-wire act performed by major banks and the world's biggest asset manager, BlackRock, as they privately soothe oil industry concerns about their public support for greener investment.

Sol. A brief reading of the sentences suggests that the paragraph is about Blackrock supporting greener ventures publicly but privately allaying fears of the oil industry. 4 sets the context for the discussion by introducing the balancing act. 3 and 2 then detail the public comments supporting greener ventures. 3 should come before 2 as the "the comments" in 2 refers to the annual letter mentioned in 3. 1 continues this by contrasting it with what they were saying in private to oil industry regulators. Hence, the order should be 4321.

22. **The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.**
Although Spain remained the largest single market for cocoa until the second half of the 19th century, consumption grew in the Philippines, and, from around the 1860s, the United States, Germany, Britain, and France became the largest industrial transformers of cocoa beans. This geographical shift in consumption paralleled a growing differentiation in trade, with overseas merchants becoming increasingly independent from Western merchants. The spatial distribution of cocoa's production witnessed the rise of plantations in the Brazilian state of Bahia, as well as in Trinidad and the Dominican Republic, and the seeds of forastero were among the protagonists of the Iberian empires' attempts to fuel the colonization of African possession in the mid-19th century.

A. As cocoa consumption grew in countries other than Spain, new players caused a differentiation in trade and expansion of plantations.

B. The ramped-up cocoa production in the mid-19th century caused changed production and trade patterns in the latter half of the 19th century.

C. Trade differentiation for cocoa was accompanied by a significant increase in the consumption and plantation patterns globally.

D. The geographical shift in cocoa consumption was accompanied by a parallel growth in production dispersion and trade differentiation.

Sol. The main point of the paragraph is that as the consumption pattern of cocoa changed (it grew from Spain to other countries), there was a corresponding differentiation in trade and also the setup of plantations in different regions. Option D comes the closest in capturing this, and hence, is the correct answer.
A: It has not been mentioned that new players were responsible for the two changes mentioned.
B: The causation implied in this question has not been mentioned in the paragraph.
C: Plantation patterns did not change but the plantations expanded to different regions. Option C is a distortion.

23. **Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.**
1. Not all of The Dropout works; there's the distracting introduction of iconography - Holmes looking in the mirror in her signature black turtleneck, signature green juice in hand.

2. Does she believe anything she's saying? It doesn't matter.
3. On the whole it achieves what Inventing Anna, Super Pumped and other scam shows have not: a portrait of a real human who perpetrated real, costly, legible harm.
4. Elizabeth rips off and doubles down on elements of the culture around her, sure, but in the show's logic, the question of blame isn't as pressing as the consequences, the tightening of the screws.

Sol. A brief reading of the sentences suggests that the paragraph is a critical review, which evaluates the character and the show. 24 here is a mandatory pair, where 2 states that it does not matter if one of the characters believes what she is saying or not, and 4 provides the explanation for the same in terms of show logic. 3 is an apt concluding sentence here and tries to paint a holistic picture. It would be better linked to 24 if 1 is between them, so that the conclusion is reached after talking about different aspects of the show, and 1 highlights a negative aspect. Thus, the correct sequence will be 2413

24. **Five sentences related to a topic are given below. Four of them can be put together to form a meaningful and coherent short paragraph. Identify the odd one out.**
1. The sharp, detailed daguerreotype profile portrait of Dickens sporting his moustache was made in around 1852-55, when he was writing Bleak House and Hard Times.
2. By 1858, it had mushroomed into the full beard he is known for today - something which friends feared aged Dickens.
3. But an "extremely rare" portrait of the author, depicting the "glorious" moustache he sported for few years only, is set to show his more dapper side.
4. Summon up an image of Charles Dickens, and his luxuriant "doorknocker" beard will be one of the first things to come to mind.
5. It was donated to the Charles Dickens Museum in London by a private collector last year, and the museum has put it on display for the first time.

Sol. A brief reading of the sentences suggests that the paragraph is about a portrait in which Dickens is sporting a moustache, unusual for him. 4 is an apt introduction, which sets the context of what the 'normal' was, and hence, as deviation from the same was baffling. 3 then talks about that deviation where the author was seen sporting a moustache. The pair 15 then talks about the genesis and the history of the portrait. Here, 2 talks about the development of the beard itself, which runs tangent to the discussion of the portrait of the moustache at hand and hence, is out of context.

Instructions

Phonotes is a Multi-National Company that conducts an annual sports league for its employees. The company has three departments and a total of 12 employees working in three divisions decided to take part in the sports league. The 12 employees were given alphabets from A to L in order to make the calls easier during the game. In every team, there should be at least one player from each division. The employees :

A, B, C, D belonged to Marketing Division.

E, F, G, H belonged to Operations Division.

I, J, K, L belonged to Accounts Division.

There were two events in total. (It is not necessary that everyone among the 12 employees should participate in an event.)

The first event was Tug of War :

The conditions specific to tug of war are :

1) The event requires two teams of 5 players each.

2) A particular team can contain a maximum of two players from each division.

3) H joins a team if and only if C is a part of the team and vice versa.

4) F and B took part in the event as representatives of opponent teams.

5) E is not willing to be a part of a team if K is already a part of the team and vice versa.

6) Exactly one among J and G takes part in the event.

7) C would like to join a team if and only if the team does not include any members from his division.

The second event was ROCK-PAPER-SCISSORS :

The conditions specific to this event are :

1) A total of 3 teams are required for the event.

2) Exactly one among C and K takes part in the event.

3) Exactly two members among F, G, I take part in the event.

4) Exactly one member among K and H does not take part in the event.

5) Each team includes a total of 3 players who belong to three different divisions.

25. In how many distinct possible way can the employees be teamed in the tug of war event?

A. 10

B. 8

C. 6

D. 4

Sol. In the game of tug of war, we are given the condition that there are 10 players in total. A maximum of 4 players from a division can take part in the event.
Hence the distribution of employees from different divisions can be :
4+4+2 or 4+3+3.
Hence at least one of the three divisions must be playing all four of their employees.
In statement 8 it has been provided that C only plays in a team if the team does not include players from his division. Hence for the marketing team in any distribution, a maximum of 3 players can take part in the event.
It has been given that exactly one among J and G will take part in the event and since they belong to different divisions among operations and accounting only one among the two divisions will be playing all four of their players.
Hence the possible configuration is 4+3+3.
It has been given that H and C are always part of the same team. Since only one among J and G takes part in the event. We must have both H and C to take part in the event.
It has been mentioned in statement 4 that F and B took part in the event as representatives of different teams.
Since B and C cannot be a part of the same team the possible configuration is :
C H F _ _
B _ _ _ _
Case 1 :
Considering the case that only one among J and G will take part in the event.
Considering J as a participant in one of the two teams :
C H F J _
B _ _ _ _
Since F and H are participants in one of the two teams E must be a member of the other team. Hence from statement 5, K must be a part of the team C H F J and the formed team is: C H F J K. Hence the members in the other team includes: B E A/D I L.
Hence the teams are :
C H F J K
B E A/D I L
Case 2:
In the case of J being a participant of the other team :
C H F _ _
B J _ _ _
E must join the team of J as two members from his division are already a part of one of the teams and hence K must join the other team(From statement 5). Since C is in one of the two teams A/D must be in the other teams as C does not join a team having members from his division and hence A/D must be in the other team.
This gives rise to the following possibilities :
C H F K I/L
B J E A/D L/I.
Case 3 :
Considering the case where G is a member of one of the teams he cannot be a part of the team including H and F.
C H F _ _
B G _ _ _
A/D must belong to the team of B as they cannot be a part of the team including C. E cannot be a part of the team including H and F and hence E must be in the other team. As provided in the other statements K must be a part of the team which does not include E.
This gives the following possibilities :

C H F K I/L
B G E A/D L/I.
A total of 2+4+4 = 10 possibilities.

26. Which of the following statement is necessarily true ?
A. In the tug of war event, A and I always represent the same team.

B. In the tug of war event, A and D always represent the same team.

C. In the tug of war event, F and L always represent the same team.

D. In the tug of war event, H and K always represent the same team.

Sol. In the game of tug of war, we are given the condition that there are 10 players in total. A maximum of 4 players from a division can take part in the event.
Hence the distribution of employees from different divisions can be :
4+4+2 or 4+3+3.
Hence at least one of the three divisions must be playing all four of their employees.
In statement 8 it has been provided that C only plays in a team if the team does not include players from his division. Hence for the marketing team in any distribution, a maximum of 3 players can take part in the event.
It has been given that exactly one among J and G will take part in the event and since they belong to different divisions among operations and accounting only one among the two divisions will be playing all four of their players.
Hence the possible configuration is 4+3+3.
It has been given that H and C are always part of the same team. Since only one among J and G takes part in the event. We must have both H and C to take part in the event.
It has been mentioned in statement 4 that F and B took part in the event as representatives of different teams.
Since B and C cannot be a part of the same team the possible configuration is :
C H F _ _
B _ _ _ _
Case 1 :
Considering the case that only one among J and G will take part in the event.
Considering J as a participant in one of the two teams :
C H F J _
B _ _ _ _
Since F and H are participants in one of the two teams E must be a member of the other team.
Hence from statement 5, K must be a part of the team C H F J and the formed team is: C H F J K. Hence the members in the other team includes: B E A/D I L.
Hence the teams are :
C H F J K
B E A/D I L
Case 2:
In the case of J being a participant of the other team :
C H F _ _
B J _ _ _

E must join the team of J as two members from his division are already a part of one of the teams and hence K must join the other team(From statement 5). Since C is in one of the two teams A/D must be in the other teams as C does not join a team having members from his division and hence A/D must be in the other team.
This gives rise to the following possibilities :
C H F K I/L
B J E A/D L/I.
Case 3 :
Considering the case where G is a member of one of the teams he cannot be a part of the team including H and F.
C H F _ _
B G _ _ _
A/D must belong to the team of B as they cannot be a part of the team including C. E cannot be a part of the team including H and F and hence E must be in the other team. As provided in the other statements K must be a part of the team which does not include E.
This gives the following possibilities :
C H F K I/L
B G E A/D L/I.
A total of 2+4+4 = 10 possibilities.
In all possible tug of war matches, H and K always represented the same team.

27. Who among the following did not necessarily take part in the tug of war event?
A. H

B. I

C. D

D. L

Sol. In the game of tug of war, we are given the condition that there are 10 players in total. A maximum of 4 players from a division can take part in the event.
Hence the distribution of employees from different divisions can be :
4+4+2 or 4+3+3.
Hence at least one of the three divisions must be playing all four of their employees.
In statement 8 it has been provided that C only plays in a team if the team does not include players from his division. Hence for the marketing team in any distribution, a maximum of 3 players can take part in the event.
It has been given that exactly one among J and G will take part in the event and since they belong to different divisions among operations and accounting only one among the two divisions will be playing all four of their players.
Hence the possible configuration is 4+3+3.
It has been given that H and C are always part of the same team. Since only one among J and G takes part in the event. We must have both H and C to take part in the event.
It has been mentioned in statement 4 that F and B took part in the event as representatives of different teams.
Since B and C cannot be a part of the same team the possible configuration is :
C H F _ _

B _ _ _ _
Case 1 :
Considering the case that only one among J and G will take part in the event.
Considering J as a participant in one of the two teams :
C H F J _
B _ _ _ _
Since F and H are participants in one of the two teams E must be a member of the other team. Hence from statement 5, K must be a part of the team C H F J and the formed team is: C H F J K. Hence the members in the other team includes: B E A/D I L.
Hence the teams are :
C H F J K
B E A/D I L
Case 2:
In the case of J being a participant of the other team :
C H F _ _
B J _ _ _
E must join the team of J as two members from his division are already a part of one of the teams and hence K must join the other team(From statement 5). Since C is in one of the two teams A/D must be in the other teams as C does not join a team having members from his division and hence A/D must be in the other team.
This gives rise to the following possibilities :
C H F K I/L
B J E A/D L/I.
Case 3 :
Considering the case where G is a member of one of the teams he cannot be a part of the team including H and F.
C H F _ _
B G _ _ _
A/D must belong to the team of B as they cannot be a part of the team including C. E cannot be a part of the team including H and F and hence E must be in the other team. As provided in the other statements K must be a part of the team which does not include E.
This gives the following possibilities :
C H F K I/L
B G E A/D L/I.
A total of 2+4+4 = 10 possibilities.
H, I and L were part of all possible tug of war team distributions. The same is not necessarily true with D.

28. In how many distinct possible can the employees be teamed in ROCK-PAPER-SCISSORS game ?
A. 172

B. 188

C. 252

D. 324

Sol. It has been mentioned that this includes 3 teams including 3 players from three divisions. Hence for the final selection, we require 3 players from the Marketing department, 3 players from the Operations department and 3 players from the Accounting department.
It has been given that of F, G AND I only two of them takes part in the event.
The possible pairs are : (FG), (GI), (FI). Since among C and K exactly one among them can be selected.
Case 1 : (FGC) is selected. K and I are not selected.
This case fails because K and I both of them belong to the accounting department.
Case 2: Selecting (FGK) (I and C are not selected).
Hence from the Marketing Division, we have : (A, B, D). Since it has been mentioned that of K and H only one of them is selected and because of this H cannot be selected. Hence from the operations division, we can select from (E, F, G). Since I is not selected we can select from (J, K, L).
For the first team, we must select 1 person each from divisions and we can choose 1 of the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.
We have :
The total number of possible selections are : $\frac{\left((3C_1).(3C_1).(3C_1).(2C_1).(2C_1).(2C_1)\right)}{3!}$
= 36.
Case 3: Selecting (GIK) and hence F and C are not selected.
Since if K is selected then H cannot be selected. But the case fails because both F and H belong to the same division.
Case 4: Selecting (GIC) or (GI) and hence F and K are not selected.
We can possibly select players (A, B, C, D) from the Marketing division. Since F is not selected we can select (E, G, H) from the Operations division. Similarly, for the Accounting department, we can select from (I, J, L).
The total number of possible selections are :
Choosing three players of the available four players among (A, B, C, D) from the marketing division. With an additional condition that C must always be selected. Hence we must select two people among A, B and D. Hence we multiply the cases with 3_{C_2}
After choosing the three we must choose for the first team we must select 1 person each from different divisions and we can choose them from the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.
(3_{C_2}) . $\frac{\left((3C_1).(3C_1).(3C_1).(2C_1).(2C_1).(2C_1)\right)}{3!}$
= 108
Case 5: Selecting (FIK). C and G are not selected.
Since if K is selected H is not selected. Since both G and H are not selected this case fails.
Case 6: Selecting (FIC). K and G are not selected.
We can possibly select players (A, B, C, D) from the Marketing division such that C is always selected. Since F is not selected we can select (E, F, H) from the Operations division. Similarly, for the Accounting department, we can select from (I, J, L).
Choosing three players of the available four players among (A, B, C, D) from the marketing division such that C is always selected. We need to make sure to select two players among A, B and D. Hence we multiply with 3_{C_2}3*C*2.
After choosing the three we must choose for the first team we must select 1 person each from different divisions and we can choose them from the three people available for each division.

Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.

$(3_{C_2}) \cdot \frac{\left((3c_1) \cdot (3c_1) \cdot (3c_1) \cdot (2c_1) \cdot (2c_1) \cdot (2c_1)\right)}{3!}$

= 108

36 + 108 + 108 = 252 possibilities.

The employees can be teamed in 252 possible ways.

Alternate explanation:

Let us divide them into two cases.

Case 1: K plays

If K plays, C can not play and H can not play.

Now, out of F, G, and I, one does not play. If we note, C is from Marketing, H is from Operations. Hence, I, who is from Accounts, does not play.

So, we have A B D - Marketing

E F G - Operations

J K L - Accounts

We have 3 sets of players from each department, who need to be chosen into 3 teams.

The number of ways of achieving it = 3! x 3! x 3!

However, we do not need to allocate them to specific teams, so, we just need their combination.

The number of ways = 3! x 3! x 3! / 3! = 36.

Case 2: K does not play

If K does not play, C and H play. Also, I J L play from Accounts.

2 of A, B, and D play from Marketing. Number of ways = 3c2 = 3

Since I plays, one of F and G plays, and E plays. Number of ways = 2! = 2

Total number of ways = 3 x 2 x 3! x 3! x 3! / 3! = 216

Total number of ways = 252.

29. Which of the following employees necessarily take part in ROCK-PAPER-SCISSORS event?

A. A

B. J

C. I

D. H

Sol. It has been mentioned that this includes 3 teams including 3 players from three divisions. Hence for the final selection, we require 3 players from the Marketing department, 3 players from the Operations department and 3 players from the Accounting department.

It has been given that of F, G AND I only two of them takes part in the event.

The possible pairs are : (FG), (GI), (FI). Since among C and K exactly one among them can be selected.

Case 1 : (FGC) is selected. K and I are not selected.

This case fails because K and I both of them belong to the accounting department.

Case 2: Selecting (FGK) (I and C are not selected).

Hence from the Marketing Division, we have : (A, B, D). Since it has been mentioned that of K and H only one of them is selected and because of this H cannot be selected. Hence from the operations division, we can select from (E, F, G). Since I is not selected we can select from (J, K, L).
For the first team, we must select 1 person each from divisions and we can choose 1 of the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.
We have :

$$\frac{\left((3C_1) \cdot (3C_1) \cdot (3C_1) \cdot (2C_1) \cdot (2C_1) \cdot (2C_1)\right)}{3!}$$

= 36.
Case 3: Selecting (GIK) and hence F and C are not selected.
Since if K is selected then H cannot be selected. But the case fails because both F and H belong to the same division.
Case 4: Selecting (GIC) or (GI) and hence F and K are not selected.
We can possibly select players (A, B, C, D) from the Marketing division. Since F is not selected we can select (E, G, H) from the Operations division. Similarly, for the Accounting department, we can select from (I, J, L).
The total number of possible selections are :
Choosing three players of the available four players among (A, B, C, D) from the marketing division. With an additional condition that C must always be selected. Hence we must select two people among A, B and D. Hence we multiply the cases with 3_{C_2}
After choosing the three we must choose for the first team we must select 1 person each from different divisions and we can choose them from the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.

$$(3_{C_2}) \cdot \frac{\left((3C_1) \cdot (3C_1) \cdot (3C_1) \cdot (2C_1) \cdot (2C_1) \cdot (2C_1)\right)}{3!}$$

= 108
Case 5: Selecting (FIK). C and G are not selected.
Since if K is selected H is not selected. Since both G and H are not selected this case fails.
Case 6: Selecting (FIC). K and G are not selected.
We can possibly select players (A, B, C, D) from the Marketing division such that C is always selected. Since F is not selected we can select (E, F, H) from the Operations division. Similarly, for the Accounting department, we can select from (I, J, L).
Choosing three players of the available four players among (A, B, C, D) from the marketing division such that C is always selected. We need to make sure to select two players among A, B and D. Hence we multiply with 3_{C_2}3*C*2.
After choosing the three we must choose for the first team we must select 1 person each from different divisions and we can choose them from the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.

$$(3_{C_2}) \cdot \frac{\left((3C_1) \cdot (3C_1) \cdot (3C_1) \cdot (2C_1) \cdot (2C_1) \cdot (2C_1)\right)}{3!}$$

= 108
36 + 108 + 108 = 252 possibilities.
The employees can be teamed in 252 possible ways.
Alternate explanation:

Let us divide them into two cases.

Case 1: K plays
If K plays, C can not play and H can not play.
Now, out of F, G, and I, one does not play. If we note, C is from Marketing, H is from Operations. Hence, I, who is from Accounts, does not play.
So, we have A B D - Marketing
E F G - Operations
J K L - Accounts
We have 3 sets of players from each department, who need to be chosen into 3 teams.
The number of ways of achieving it = 3! x 3! x 3!
However, we do not need to allocate them to specific teams, so, we just need their combination.
The number of ways = 3! x 3! x 3! / 3! = 36.
Case 2: K does not play
If K does not play, C and H play. Also, I J L play from Accounts.
2 of A, B, and D play from Marketing. Number of ways = 3c2 = 3
Since I plays, one of F and G plays, and E plays. Number of ways = 2! = 2
Total number of ways = 3 x 2 x 3! x 3! x 3! / 3! = 216
Total number of ways = 252.

J takes part in all possible events of ROCK- PAPER-SCISSOR events.

30. Whenever J is part of a Rock-Paper-Scissors game, who among the following must also be a part of the game ?
A. H
B. L
C. F
D. D

Sol. It has been mentioned that this includes 3 teams including 3 players from three divisions. Hence for the final selection, we require 3 players from the Marketing department, 3 players from the Operations department and 3 players from the Accounting department.
It has been given that of F, G AND I only two of them takes part in the event.
The possible pairs are : (FG), (GI), (FI). Since among C and K exactly one among them can be selected.
Case 1 : (FGC) is selected. K and I are not selected.
This case fails because K and I both of them belong to the accounting department.
Case 2: Selecting (FGK) (I and C are not selected).
Hence from the Marketing Division, we have : (A, B, D). Since it has been mentioned that of K and H only one of them is selected and because of this H cannot be selected. Hence from the operations division, we can select from (E, F, G). Since I is not selected we can select from (J, K, L).
For the first team, we must select 1 person each from divisions and we can choose 1 of the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.
We have :
The total number of possible selections are

$$\frac{\left({}^{3}C_{1}\right)\cdot\left({}^{3}C_{1}\right)\cdot\left({}^{3}C_{1}\right)\cdot\left({}^{2}C_{1}\right)\cdot\left({}^{2}C_{1}\right)\cdot\left({}^{2}C_{1}\right)}{3!}$$

= 36.

Case 3: Selecting (GIK) and hence F and C are not selected.
Since if K is selected then H cannot be selected. But the case fails because both F and H belong to the same division.
Case 4: Selecting (GIC) or (GI) and hence F and K are not selected.
We can possibly select players (A, B, C, D) from the Marketing division. Since F is not selected we can select (E, G, H) from the Operations division. Similarly, for the Accounting department, we can select from (I, J, L).
The total number of possible selections are :
Choosing three players of the available four players among (A, B, C, D) from the marketing division. With an additional condition that C must always be selected. Hence we must select two people among A, B and D. Hence we multiply the cases with 3_{C_2}
After choosing the three we must choose for the first team we must select 1 person each from different divisions and we can choose them from the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.

$(3_{C_2}) \cdot \frac{\left((3_{C_1}) \cdot (3_{C_1}) \cdot (3_{C_1}) \cdot (2_{C_1}) \cdot (2_{C_1}) \cdot (2_{C_1})\right)}{3!}$

= 108
Case 5: Selecting (FIK). C and G are not selected.
Since if K is selected H is not selected. Since both G and H are not selected this case fails.
Case 6: Selecting (FIC). K and G are not selected.
We can possibly select players (A, B, C, D) from the Marketing division such that C is always selected. Since F is not selected we can select (E, F, H) from the Operations division. Similarly, for the Accounting department, we can select from (I, J, L).
Choosing three players of the available four players among (A, B, C, D) from the marketing division such that C is always selected. We need to make sure to select two players among A, B and D. Hence we multiply with 3_{C_2}3*C*2.
After choosing the three we must choose for the first team we must select 1 person each from different divisions and we can choose them from the three people available for each division. Similarly, for the next team, we have to choose one person among two people from each division. Since the order is not necessary.

$(3_{C_2}) \cdot \frac{\left((3_{C_1}) \cdot (3_{C_1}) \cdot (3_{C_1}) \cdot (2_{C_1}) \cdot (2_{C_1}) \cdot (2_{C_1})\right)}{3!}$

= 108
36 + 108 + 108 = 252 possibilities.
The employees can be teamed in 252 possible ways.
Alternate explanation:

Let us divide them into two cases.
Case 1: K plays
If K plays, C can not play and H can not play.
Now, out of F, G, and I, one does not play. If we note, C is from Marketing, H is from Operations. Hence, I, who is from Accounts, does not play.
So, we have A B D - Marketing
E F G - Operations
J K L - Accounts
We have 3 sets of players from each department, who need to be chosen into 3 teams.
The number of ways of achieving it = 3! x 3! x 3!
However, we do not need to allocate them to specific teams, so, we just need their combination.
The number of ways = 3! x 3! x 3! / 3! = 36.

Case 2: K does not play
If K does not play, C and H play. Also, I J L play from Accounts.
2 of A, B, and D play from Marketing. Number of ways = 3c2 = 3
Since I plays, one of F and G plays, and E plays. Number of ways = 2! = 2
Total number of ways = 3 x 2 x 3! x 3! x 3! / 3! = 216
Total number of ways = 252.
J is a part of all possible team selections and hence the other player must also be a part of all possible teams L and E are the only possible employee who can take part in all possible games J is involved in.

Instructions

There is a box having nine cards with the numbers 1 to 9 written on them. Ravi picks up one card at a time, without being aware of the number and then places the numbers side by side to get a nine-digit code. Now, in the 9-digit code, if there is any number divisible by 2 immediately followed by a number divisible by 3, then this pair is called a rewarding pair. No two rewarding pairs can have a common number between them. Hence, if there are n rewarding pairs, there are 2n numbers among these pairs. At the end of the activity, Ravi is paid Rs 200 for each rewarding pair that the code has. If the code has 2 rewarding pairs, he is paid Rs 400, and so on.
For example- The code 123456789 has two rewarding pairs -23- and -89-.
Based on the information, answer the questions that follow.

31. If the final code is in the form of __ 2 __ __ __ 6 __ __ 9, how many codes are possible if Ravi wins Rs 600?
A. 12
B. 24
C. 2
D. 48

Sol. Ravi gets three rewarding pairs.
__ 2 __ __ __ 6 __ __ 9
Now, only 'three' multiples of 3 are available, so we can have at most three rewarding pairs. Hence, all the multiples of 3 must come after a multiple of 2. Now, the number of multiples of 2 that are left is 3. Hence, the multiples of 2 come before a multiple of 3. 2 must be followed by 3. And 4 and 8 come before 6 and 9(in no particular order). Hence we get 2 cases.
__ 2 3 __ 4/8 6 __ 4/8 9
Now, the remaining 3 spaces can be filled in 3! ways.
Hence a total of 2.3!, that is, twelve ways.

32. It is known that 1, 2 and 3 are the first three numbers in the code(in no particular order), and 9, 8 and 7 are the last three numbers in the code(in no particular order), then how many codes are possible to win Rs 600?

Sol. Ravi gets three rewarding pairs.
Now, only 'three' multiples of 3 are available, so we can have at most three rewarding pairs. Hence, all the multiples of 3 must come after a multiple of 2. Now, the number of multiples of 2 that are left is 3. Hence, the multiples of 2 come before a multiple of 3.

Since 1, 2, and 3 come together, we know that in the first three numbers, '23' must be present as a pair. Similarly, in the middle numbers, '46' must be present as a pair, and the last, '89' must be present as a pair. So, in the first three numbers, we can have 123 or 231, similarly for the second, we can have 546 or 465, and in the third, we can have 897 or 789. Hence, we have a total of
2 x 2 x 2 = 8 cases.

33. What is the total number of codes possible to win Rs. 600?

Sol. Ravi gets three rewarding pairs.
Now, only 'three' multiples of 3 are available, so we can have at most three rewarding pairs. Hence, all the multiples of 3 must come after a multiple of 2. Now, the number of multiples of 2 that are left is 3. Hence, the multiples of 2 come before a multiple of 3.
Now, multiples of 3 are 3, 6, 9, multiples of 2 are 2, 4, 8. We know that each pair has one multiple of 2 followed by one multiple of 3. Hence the total number of ways of selecting and arranging them is equal to 3! x 3! = 36.
Now, the three pairs are fixed along with their relative positions.
(__ __) (__ __) (__ __)
↑ ↑ ↑ ↑
We can insert the remaining 3 numbers in any of the positions depicted by arrows, in any order. First, all these numbers will be able to arrange in 3! ways.
Now, as far as the positioning is done, we can have
Case 1: One number each in each of the vacant spaces(↑) and one space left. Number of ways = 4
Case 2: Two numbers in one of the vacant spaces(↑) and one number in another vacant space(↑) and two spaces left. Number of ways = 4 x 3 = 12
Case 3: Three numbers in one of the vacant spaces, and three spaces left. Number of ways = 4
Number of ways = 20 x 3! x 36 = 20 x 6 x 36 = 4320.

34. If in the previous question, no two of 1, 5, and 7 come together, what is the number of codes possible?

Sol. Ravi gets three rewarding pairs.
Now, only 'three' multiples of 3 are available, so we can have at most three rewarding pairs. Hence, all the multiples of 3 must come after a multiple of 2. Now, the number of multiples of 2 that are left is 3. Hence, the multiples of 2 come before a multiple of 3.
Now, multiples of 3 are 3, 6, 9, multiples of 2 are 2, 4, 8. We know that each pair has one multiple of 2 followed by one multiple of 3. Hence the total number of ways of selecting and arranging them is equal to 3! x 3! = 36.
Now, the three pairs are fixed along with their relative positions.
(__ __) (__ __) (__ __)
↑ ↑ ↑ ↑
We can insert the remaining 3 numbers in any of the positions depicted by arrows, in any order. First, all these numbers will be able to arrange in 3! ways.
Now, as far as the positioning is done, we can have
Case 1: One number each in each of the vacant spaces(↑) and one space left. Number of ways = 4
Case 2: Two numbers in one of the vacant spaces(↑) and one number in another vacant space(↑) and two spaces left. Number of ways = 4 x 3 = 12
Case 3: Three numbers in one of the vacant spaces, and three spaces left. Number of ways = 4

Number of ways = 20 x 3! x 36 = 20 x 6 x 36 = 4320.
In this question, we consider only the first case.
4 x 6 x 36 = 864.

Instructions

For the IRL (International racing league) 2022 edition the governing authority has decided to increase the number of teams by 5 where each of the new teams represents a new city. Bidding has been called in for the 5 cities.
The following table represents the number of bidders for each region and the amount bid by the bidders in decreasing order. The amount mentioned in the table is in crores.

City	Tokyo	Berlin	Oslo	Nairobi	Denver
No. Of Bidders	4	6	5	7	8
Highest Bidding	1680	832			410
2nd Highest Bidding	1400	768		351	
3rd Highest Bidding	1225		270		392
4th Highest Bidding	900	643			
5th Highest Bidding		542			252
6th Highest Bidding		414			
7th Highest Bidding					
8th Highest Bidding					
Total Bidding Amount	5205	3911	3858	2093	2604

The following information has been provided about the bidding :
1) Every bidder must bid at least an amount of 10 crores.
2) Every bid made should be a perfect multiple of 1 crore.
3) For the city of Oslo, the highest bid is not greater than 2600 crores. There were exactly three bids in Oslo whose value is one-third the value of their next higher bid.
4) For every team all the bidding amounts were distinct.
5) For Nairobi the difference between any pair of consecutive bids is equal.

35. The lowest bid of which city was the highest among the following four cities?
A. Berlin
B. Oslo
C. Nairobi
D. Denver

Sol. For the city of Berlin, the total bidding amount is given and 5 of the 6 bids are provided.
Considering K to be the remaining bid :
We have : 832+768+K+643+542+414 = 3911.
Hence the value of K = 712.
For the city of Oslo, it has been given that the third-highest bid is 270 crores and the total amount of bids is 3858 crores. It has also been mentioned that the maximum possible highest bid is Rs 2600 crores and there are exactly three bids such that their value is one-third of their next higher bid.
Considering the different possible cases :
In decreasing order of the bids :
Case 1: (X, 810, 270, 90, 30). X cannot be 2430 because then the number of bids with one-third value becomes 4.
The maximum possible total sum of bid value is : 2600+810+270+90+30 = 3800 crores. Hence this case fails.
Case 2: (3P, P, 270, 90, 30). The maximum value 3P can takes is 2598 and hence P = 864.
The maximum possible total sum of bid value is : 2598+864+270+90+30 = 3852 crores. Hence this is not possible.
Case 3: (2430, 810, 270, 3Q, Q). The maximum value of 3Q = 267 and hence Q = 89.
The maximum possible total sum of bid value is: 2430+810+270+267+89 = 3866 crores.
The sum can be 3858 crores if 3Q = 261 crores, Q = 87 crores.
(2430, 810, 270, 261, 87). This satisfies all the conditions.
Case 4: (2430, 810, 270, 90, P). The maximum possible sum is when P = 89 and hence the value of sum is 2430+810+270+90+89 = 3689.
Hence the bids for Oslo are :
(2430, 810, 270, 261, 87).
For the city of Denver, the total bidding sum is 2604.
The bidding amounts for the first, third and the fifth-highest amounts are :
(410, 392 and 252).
The total bidding amount is 2604.
The sum of the remaining five bids is equal to 2604 - 1054 = 1550.
This is possible when the remaining bids are the maximum possible :
(409+391+251+250+249 = 1550.)
Hence the eight bids of Denver are :
(410, 409, 392, 391, 252, 251, 250, 249).
For Nairobi, it has been given that the difference between consecutive bids is equal.
Hence the bids must have been in an A.P.
Considering the lowest bid to be a the highest bid will be equal to a+6x.
The total combined amount of all seven bids :
a, a+x,.....a+6x = 7a+21x.
Hence this is given by 2093.
Hence a+3x = 299.
In the table the value of a+5x is equal to 351. Hence the value of 2x = 52 and x = 26 and a = 221.
The bids of Denver are : (221, 247, 273, 299, 325, 351, 377).
The final representation of all the bids is given by

City	Tokyo	Berlin	Oslo	Nairobi	Denver
Number of Bidders	4	6	5	7	8
Highest bidding	1680	832	2430	377	410
2nd Highest bidding	1400	768	810	351	409
3rd highest bidding	1225	732	270	325	392
4th highest bidding	900	643	261	299	391
5th highest bidding		542	87	273	252
6th highest bidding		414		247	251
7th highest bidding				221	250
8th highest bidding					249
Total Bidding amount	5205	3911	3858	2093	2604

Berlin had 414 as the lowest bid. This is the highest possible value among the four cities.

36. A total of how many bids were made such that the bid amount was greater than 650 crores?

Sol. For the city of Berlin, the total bidding amount is given and 5 of the 6 bids are provided.
Considering K to be the remaining bid :
We have : 832+768+K+643+542+414 = 3911.
Hence the value of K = 712.
For the city of Oslo, it has been given that the third-highest bid is 270 crores and the total amount of bids is 3858 crores. It has also been mentioned that the maximum possible highest bid is Rs 2600 crores and there are exactly three bids such that their value is one-third of their next higher bid.
Considering the different possible cases :
In decreasing order of the bids :
Case 1: (X, 810, 270, 90, 30). X cannot be 2430 because then the number of bids with one-third value becomes 4.
The maximum possible total sum of bid value is : 2600+810+270+90+30 = 3800 crores. Hence this case fails.
Case 2: (3P, P, 270, 90, 30). The maximum value 3P can takes is 2598 and hence P = 864.
The maximum possible total sum of bid value is : 2598+864+270+90+30 = 3852 crores. Hence this is not possible.
Case 3: (2430, 810, 270, 3Q, Q). The maximum value of 3Q = 267 and hence Q = 89.

The maximum possible total sum of bid value is: 2430+810+270+267+89 = 3866 crores.
The sum can be 3858 crores if 3Q = 261 crores, Q = 87 crores.
(2430, 810, 270, 261, 87). This satisfies all the conditions.
Case 4: (2430, 810, 270, 90, P). The maximum possible sum is when P = 89 and hence the value of sum is 2430+810+270+90+89 = 3689.
Hence the bids for Oslo are :
(2430, 810, 270, 261, 87).
For the city of Denver, the total bidding sum is 2604.
The bidding amounts for the first, third and the fifth-highest amounts are :
(410, 392 and 252).
The total bidding amount is 2604.
The sum of the remaining five bids is equal to 2604 - 1054 = 1550.
This is possible when the remaining bids are the maximum possible :
(409+391+251+250+249 = 1550.)
Hence the eight bids of Denver are :
(410, 409, 392, 391, 252, 251, 250, 249).
For Nairobi, it has been given that the difference between consecutive bids is equal.
Hence the bids must have been in an A.P.
Considering the lowest bid to be a the highest bid will be equal to a+6x.
The total combined amount of all seven bids :
a, a+x,.....a+6x = 7a+21x.
Hence this is given by 2093.
Hence a+3x = 299.
In the table the value of a+5x is equal to 351. Hence the value of 2x = 52 and x = 26 and a = 221.
The bids of Denver are : (221, 247, 273, 299, 325, 351, 377).
The final representation of all the bids is given by :

City	Tokyo	Berlin	Oslo	Nairobi	Denver
Number of Bidders	4	6	5	7	8
Highest bidding	1680	832	2430	377	410
2nd Highest bidding	1400	768	810	351	409
3rd highest bidding	1225	732	270	325	392
4th highest bidding	900	643	261	299	391
5th highest bidding		542	87	273	252
6th highest bidding		414		247	251
7th highest bidding				221	250
8th highest bidding					249
Total Bidding amount	5205	3911	3858	2093	2604

The total number of bids with a bid value greater than 650 crores is: 9

37. What is the lowest bidding amount for the city of Oslo ?
A. 89 crores
B. 88 crores
C. 87 crores
D. 93 crores

Sol. For the city of Berlin, the total bidding amount is given and 5 of the 6 bids are provided.
Considering K to be the remaining bid :
We have : 832+768+K+643+542+414 = 3911.
Hence the value of K = 712.
For the city of Oslo, it has been given that the third-highest bid is 270 crores and the total amount of bids is 3858 crores. It has also been mentioned that the maximum possible highest bid is Rs 2600 crores and there are exactly three bids such that their value is one-third of their next higher bid.
Considering the different possible cases :
In decreasing order of the bids :
Case 1: (X, 810, 270, 90, 30). X cannot be 2430 because then the number of bids with one-third value becomes 4.
The maximum possible total sum of bid value is : 2600+810+270+90+30 = 3800 crores. Hence this case fails.
Case 2: (3P, P, 270, 90, 30). The maximum value 3P can takes is 2598 and hence P = 864.
The maximum possible total sum of bid value is : 2598+864+270+90+30 = 3852 crores. Hence this is not possible.
Case 3: (2430, 810, 270, 3Q, Q). The maximum value of 3Q = 267 and hence Q = 89.
The maximum possible total sum of bid value is: 2430+810+270+267+89 = 3866 crores.
The sum can be 3858 crores if 3Q = 261 crores, Q = 87 crores.
(2430, 810, 270, 261, 87). This satisfies all the conditions.
Case 4: (2430, 810, 270, 90, P). The maximum possible sum is when P = 89 and hence the value of sum is 2430+810+270+90+89 = 3689.
Hence the bids for Oslo are :
(2430, 810, 270, 261, 87).
For the city of Denver, the total bidding sum is 2604.
The bidding amounts for the first, third and the fifth-highest amounts are :
(410, 392 and 252).
The total bidding amount is 2604.
The sum of the remaining five bids is equal to 2604 - 1054 = 1550.
This is possible when the remaining bids are the maximum possible :
(409+391+251+250+249 = 1550.)
Hence the eight bids of Denver are :
(410, 409, 392, 391, 252, 251, 250, 249).
For Nairobi, it has been given that the difference between consecutive bids is equal.
Hence the bids must have been in an A.P.
Considering the lowest bid to be a the highest bid will be equal to a+6x.
The total combined amount of all seven bids :
a, a+x,.....a+6x = 7a+21x.
Hence this is given by 2093.
Hence a+3x = 299.

In the table the value of a+5x is equal to 351. Hence the value of 2x = 52 and x = 26 and a = 221.
The bids of Denver are : (221, 247, 273, 299, 325, 351, 377).
The final representation of all the bids are given by :

City	Tokyo	Berlin	Oslo	Nairobi	Denver
Number of Bidders	4	6	5	7	8
Highest bidding	1680	832	2430	377	410
2nd Highest bidding	1400	768	810	351	409
3rd highest bidding	1225	732	270	325	392
4th highest bidding	900	643	261	299	391
5th highest bidding		542	87	273	252
6th highest bidding		414		247	251
7th highest bidding				221	250
8th highest bidding					249
Total Bidding amount	5205	3911	3858	2093	2604

The lowest bidding amount for Oslo is 87 crores.

38. The bid with highest monetary value was placed for which city ?
A. Tokyo
B. Berlin
C.Oslo
D. Denver

Sol. For the city of Berlin, the total bidding amount is given and 5 of the 6 bids are provided.
Considering K to be the remaining bid :
We have : 832+768+K+643+542+414 = 3911.
Hence the value of K = 712.
For the city of Oslo, it has been given that the third-highest bid is 270 crores and the total amount of bids is 3858 crores. It has also been mentioned that the maximum possible highest bid is Rs 2600 crores and there are exactly three bids such that their value is one-third of their next higher bid.
Considering the different possible cases :
In decreasing order of the bids :
Case 1: (X, 810, 270, 90, 30). X cannot be 2430 because then the number of bids with one-third value becomes 4.
The maximum possible total sum of bid value is : 2600+810+270+90+30 = 3800 crores. Hence this case fails.
Case 2: (3P, P, 270, 90, 30). The maximum value 3P can takes is 2598 and hence P = 864.

The maximum possible total sum of bid value is : 2598+864+270+90+30 = 3852 crores. Hence this is not possible.
Case 3: (2430, 810, 270, 3Q, Q). The maximum value of 3Q = 267 and hence Q = 89.
The maximum possible total sum of bid value is: 2430+810+270+267+89 = 3866 crores.
The sum can be 3858 crores if 3Q = 261 crores, Q = 87 crores.
(2430, 810, 270, 261, 87). This satisfies all the conditions.
Case 4: (2430, 810, 270, 90, P). The maximum possible sum is when P = 89 and hence the value of sum is 2430+810+270+90+89 = 3689.
Hence the bids for Oslo are :
(2430, 810, 270, 261, 87).
For the city of Denver, the total bidding sum is 2604.
The bidding amounts for the first, third and the fifth-highest amounts are :
(410, 392 and 252).
The total bidding amount is 2604.
The sum of the remaining five bids is equal to 2604 - 1054 = 1550.
This is possible when the remaining bids are the maximum possible :
(409+391+251+250+249 = 1550.)
Hence the eight bids of Denver are :
(410, 409, 392, 391, 252, 251, 250, 249).
For Nairobi, it has been given that the difference between consecutive bids is equal.
Hence the bids must have been in an A.P.
Considering the lowest bid to be a the highest bid will be equal to a+6x.
The total combined amount of all seven bids :
a, a+x,.....a+6x = 7a+21x.
Hence this is given by 2093.
Hence a+3x = 299.
In the table the value of a+5x is equal to 351. Hence the value of 2x = 52 and x = 26 and a = 221.
The bids of Denver are : (221, 247, 273, 299, 325, 351, 377).
The final representation of all the bids are given by :

City	Tokyo	Berlin	Oslo	Nairobi	Denver
Number of Bidders	4	6	5	7	8
Highest bidding	1680	832	2430	377	410
2nd Highest bidding	1400	768	810	351	409
3rd highest bidding	1225	732	270	325	392
4th highest bidding	900	643	261	299	391
5th highest bidding		542	87	273	252
6th highest bidding		414		247	251
7th highest bidding				221	250
8th highest bidding					249
Total Bidding amount	5205	3911	3858	2093	2604

The bid with the highest monetary value is placed for the city of Oslo.

39. The average bidding value for how many cities is an integral multiple of 1 crore?

Sol. For the city of Berlin, the total bidding amount is given and 5 of the 6 bids are provided.
Considering K to be the remaining bid :
We have : 832+768+K+643+542+414 = 3911.
Hence the value of K = 712.
For the city of Oslo, it has been given that the third-highest bid is 270 crores and the total amount of bids is 3858 crores. It has also been mentioned that the maximum possible highest bid is Rs 2600 crores and there are exactly three bids such that their value is one-third of their next higher bid.
Considering the different possible cases :
In decreasing order of the bids :
Case 1: (X, 810, 270, 90, 30). X cannot be 2430 because then the number of bids with one-third value becomes 4.
The maximum possible total sum of bid value is : 2600+810+270+90+30 = 3800 crores. Hence this case fails.
Case 2: (3P, P, 270, 90, 30). The maximum value 3P can takes is 2598 and hence P = 864.
The maximum possible total sum of bid value is : 2598+864+270+90+30 = 3852 crores. Hence this is not possible.
Case 3: (2430, 810, 270, 3Q, Q). The maximum value of 3Q = 267 and hence Q = 89.
The maximum possible total sum of bid value is: 2430+810+270+267+89 = 3866 crores.
The sum can be 3858 crores if 3Q = 261 crores, Q = 87 crores.
(2430, 810, 270, 261, 87). This satisfies all the conditions.
Case 4: (2430, 810, 270, 90, P). The maximum possible sum is when P = 89 and hence the value of sum is 2430+810+270+90+89 = 3689.

Hence the bids for Oslo are :
(2430, 810, 270, 261, 87).
For the city of Denver, the total bidding sum is 2604.
The bidding amounts for the first, third and the fifth-highest amounts are :
(410, 392 and 252).
The total bidding amount is 2604.
The sum of the remaining five bids is equal to 2604 - 1054 = 1550.
This is possible when the remaining bids are the maximum possible :
(409+391+251+250+249 = 1550.)
Hence the eight bids of Denver are :
(410, 409, 392, 391, 252, 251, 250, 249).
For Nairobi, it has been given that the difference between consecutive bids is equal.
Hence the bids must have been in an A.P.
Considering the lowest bid to be a the highest bid will be equal to a+6x.
The total combined amount of all seven bids :
a, a+x,.....a+6x = 7a+21x.
Hence this is given by 2093.
Hence a+3x = 299.
In the table the value of a+5x is equal to 351. Hence the value of 2x = 52 and x = 26 and a = 221.
The bids of Denver are : (221, 247, 273, 299, 325, 351, 377).
The final representation of all the bids are given by :

City	Tokyo	Berlin	Oslo	Nairobi	Denver
Number of Bidders	4	6	5	7	8
Highest bidding	1680	832	2430	377	410
2nd Highest bidding	1400	768	810	351	409
3rd highest bidding	1225	732	270	325	392
4th highest bidding	900	643	261	299	391
5th highest bidding		542	87	273	252
6th highest bidding		414		247	251
7th highest bidding				221	250
8th highest bidding					249
Total Bidding amount	5205	3911	3858	2093	2604

The average bidding value is an integer only for the city of Nairobi. Hence the answer is 1.

40. Which city has the highest range of bids?
Range = Highest bid - Lowest bid
A. Denver
B. Nairovi
C. Tokyo
D. Oslo

Sol. For the city of Berlin, the total bidding amount is given and 5 of the 6 bids are provided.
Considering K to be the remaining bid :
We have : 832+768+K+643+542+414 = 3911.
Hence the value of K = 712.
For the city of Oslo, it has been given that the third-highest bid is 270 crores and the total amount of bids is 3858 crores. It has also been mentioned that the maximum possible highest bid is Rs 2600 crores and there are exactly three bids such that their value is one-third of their next higher bid.
Considering the different possible cases :
In decreasing order of the bids :
Case 1: (X, 810, 270, 90, 30). X cannot be 2430 because then the number of bids with one-third value becomes 4.
The maximum possible total sum of bid value is : 2600+810+270+90+30 = 3800 crores. Hence this case fails.
Case 2: (3P, P, 270, 90, 30). The maximum value 3P can takes is 2598 and hence P = 864.
The maximum possible total sum of bid value is : 2598+864+270+90+30 = 3852 crores. Hence this is not possible.
Case 3: (2430, 810, 270, 3Q, Q). The maximum value of 3Q = 267 and hence Q = 89.
The maximum possible total sum of bid value is: 2430+810+270+267+89 = 3866 crores.
The sum can be 3858 crores if 3Q = 261 crores, Q = 87 crores.
(2430, 810, 270, 261, 87). This satisfies all the conditions.
Case 4: (2430, 810, 270, 90, P). The maximum possible sum is when P = 89 and hence the value of sum is 2430+810+270+90+89 = 3689.
Hence the bids for Oslo are :
(2430, 810, 270, 261, 87).
For the city of Denver, the total bidding sum is 2604.
The bidding amounts for the first, third and the fifth-highest amounts are :
(410, 392 and 252).
The total bidding amount is 2604.
The sum of the remaining five bids is equal to 2604 - 1054 = 1550.
This is possible when the remaining bids are the maximum possible :
(409+391+251+250+249 = 1550.)
Hence the eight bids of Denver are :
(410, 409, 392, 391, 252, 251, 250, 249).
For Nairobi, it has been given that the difference between consecutive bids is equal.
Hence the bids must have been in an A.P.
Considering the lowest bid to be a the highest bid will be equal to a+6x.
The total combined amount of all seven bids :
a, a+x,.....a+6x = 7a+21x.
Hence this is given by 2093.
Hence a+3x = 299.
In the table the value of a+5x is equal to 351. Hence the value of 2x = 52 and x = 26 and a = 221.

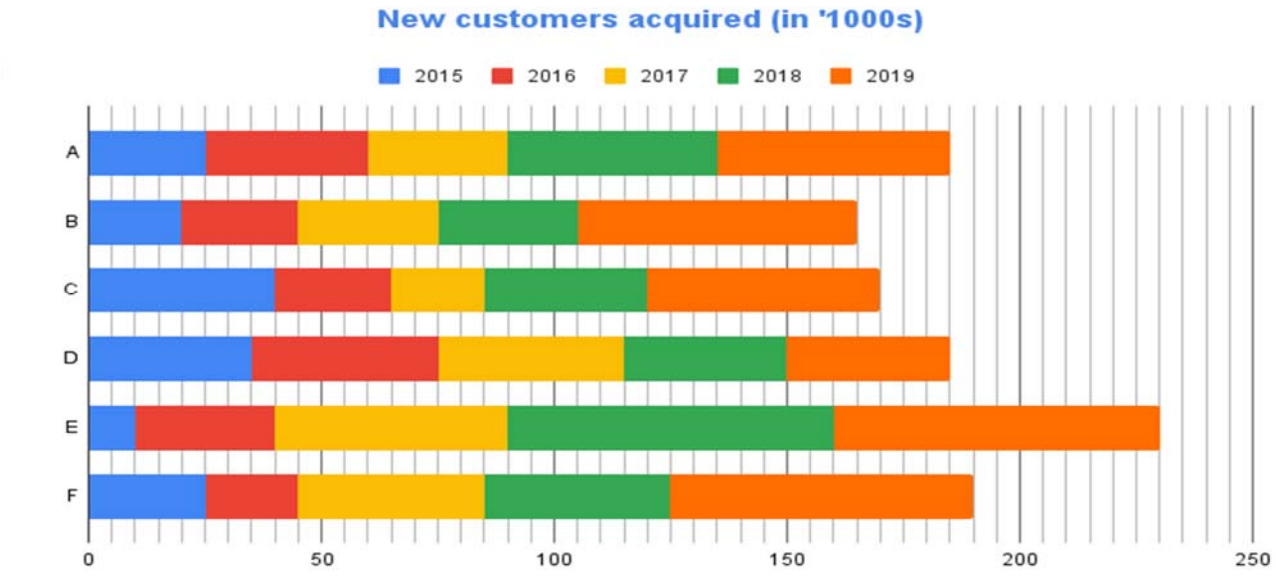
The bids of Denver are : (221, 247, 273, 299, 325, 351, 377).
The final representation of all the bids is given by :

City	Tokyo	Berlin	Oslo	Nairobi	Denver
Number of Bidders	4	6	5	7	8
Highest bidding	1680	832	2430	377	410
2nd Highest bidding	1400	768	810	351	409
3rd highest bidding	1225	732	270	325	392
4th highest bidding	900	643	261	299	391
5th highest bidding		542	87	273	252
6th highest bidding		414		247	251
7th highest bidding				221	250
8th highest bidding					249
Total Bidding amount	5205	3911	3858	2093	2604

Oslo has the greatest value for the highest bid and the least value for the lowest bid. Hence, Oslo is the answer.

Instructions

The following graph shows the number of new customers acquired by smartphones launched by six different companies over the years.



Based on the information provided, answer the questions that follow.

41. How many companies gained at least 50% more new customers in 2019 than they did in 2015?

A. 2
B. 4
C. 5
D. 6

Sol.

	2015	2016	2017	2018	2019	
A	25	35	30	45	50	100% more
B	20	25	30	30	60	200% more
C	40	25	20	35	50	25% more
D	35	40	40	35	35	0%
E	10	30	50	70	70	600% more
F	25	20	40	40	65	160% more

Four different companies satisfy the criteria.

42. How many companies gained more than 50% of their customers in the last two years?

A. 3
B. 4
C. 6
D. 5

Sol.

	2015	2016	2017	2018	2019	Total number of customers	2018+2019
A	25	35	30	45	50	185	95
B	20	25	30	30	60	165	90
C	40	25	20	35	50	170	85
D	35	40	40	35	35	185	70
E	10	30	50	70	70	230	140
F	25	20	40	40	65	190	105

A, B, E and F are the four companies that had more than 50% of the total customers being acquired in the last two years.

43. A year is divided into four quarters Q1, Q2, Q3, and Q4. If in 2019, for each company, the number of new customers acquired in Q1, Q2, Q3, and Q4 respectively are in ratio 1:1:2:1, find out the sum of the number of new customers(in '1000s) gained by A in Q1, B in Q2, C in Q3, and E in Q4 in 2019.

Sol.

	2019	Q1	Q2	Q3	Q4
A	50	10	10	20	10
B	60	12	12	24	12
C	50	10	10	20	10
D	35	7	7	14	7
E	70	14	14	28	14
F	65	13	13	26	13

A in Q1 = 10
B in Q2 = 12
C in Q3 = 20
E in Q4 = 14
Sum = 56.
56,000 is the total number of new customers acquired.

44. Customer Acquisition Percentage Change (CAPC) for a year is defined as the percentage increase or decrease of the number of new customers acquired from that year to the next year. For how many companies did the CAPC value (in percentage) not exceed 25% for any of the years 2015, 2016, 2017 and 2018?
A. 1
B. 2
C. 3
D. 4

Sol.

	2015	2016	2017	2018	2019
A	25	35	30	45	50
B	20	25	30	30	60
C	40	25	20	35	50
D	35	40	40	35	35
E	10	30	50	70	70
F	25	20	40	40	65

A - 25 to 35 in 2015-16, and 30 to 45 from 2017-18 -> Doesn't satisfy
B - 30 to 60 in 2018-19 -> Doesn't satisfy
C - 40 to 25 in 2015-16, 20 to 35 in 2017-18, and 35 to 50 in 2018-19
D - ✓
E - 10 - 30 [15-16], 30 - 50 [16-17], 50 - 70 [17-18]
F - 20 - 40 [16-17], 40 - 65 [18-19]
Only D satisfies.

45. There are a number of red balloons and blue balloons in the ratio of x:y*x*:*y* such that x and y are co-prime natural numbers and $1 < x \leq y < 5$. If we add 7 red and 7 blue balloons, the ratio changes to a : b where a and b are co-prime natural numbers and $1 < a \leq b < 5$. Find out the total number of balloons in the end.
Enter -1 if the answer can not be determined.

Sol. x and y and a and b satisfy a similar relation.
x and y can either be 2 and 3 or 3 and 4. Same with a and b.
So, Case 1:
x : y = 2 : 3, a : b = 3 : 4
Let the initial number of balloons be 2m and 3m.
$\frac{2m+7}{3m+7} = \frac{3}{4}$
m = 7
Hence, we get the total number of balloons to be (2 + 3)7 + 7 + 7 = 49.
Case 2:
x : y = 3 : 4 a : b = 2 : 3
Let the initial number of balloons be 3m and 4m.
$\frac{3m+7}{4m+7} = \frac{2}{3}$
m = - 7, which is not possible
Hence, 49 is the answer

46. A company's logo is in the form of an equilateral triangle with an incircle and a circumcircle. Find out the unshaded area, if the radius of the outer circle is 7 cm.

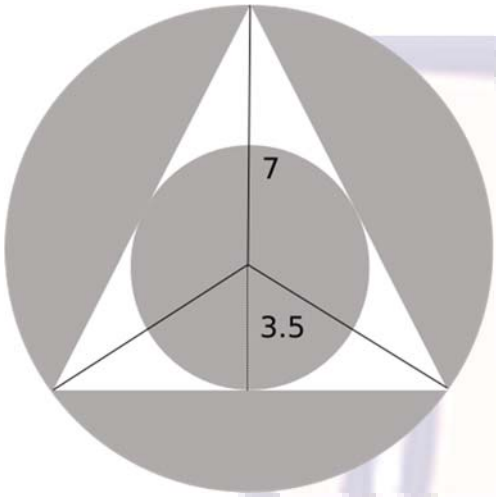
A. $\frac{7}{2}\left[\frac{21}{2}\sqrt{3} - 11\right]$

B. $\frac{7}{3}\left[\frac{21}{2}\sqrt{3} - 11\right]$

C. $\frac{7}{2}\left[\frac{21}{2}\sqrt{3} - 7\right]$

D. $\frac{7}{2}\left[\frac{21}{4}\sqrt{3} - 11\right]$

Sol.



Let the side of the equilateral triangle be a.

Circumradius = $\frac{a}{\sqrt{3}}$

a = $7\sqrt{3}$

Area of the triangle = $\frac{\sqrt{3}}{4}a^2 = \frac{\sqrt{3}}{4}(7\sqrt{3})^2 = \frac{\sqrt{3}}{4}49 \times 3 = \frac{147}{4}\sqrt{3}$

Area of the incircle = $\frac{22}{7} \times 3.5 \times 3.5 = 11 \times 3.5 = \frac{77}{2}$

Hence, unshaded region = $\frac{147}{4}\sqrt{3} - \frac{77}{2} = \frac{7}{2}\left[\frac{21}{2}\sqrt{3} - 11\right]$

47. Find out the area enclosed between the following graphs:

$|x| + |y| \leq 2$

$x^2+y^2 > 2$

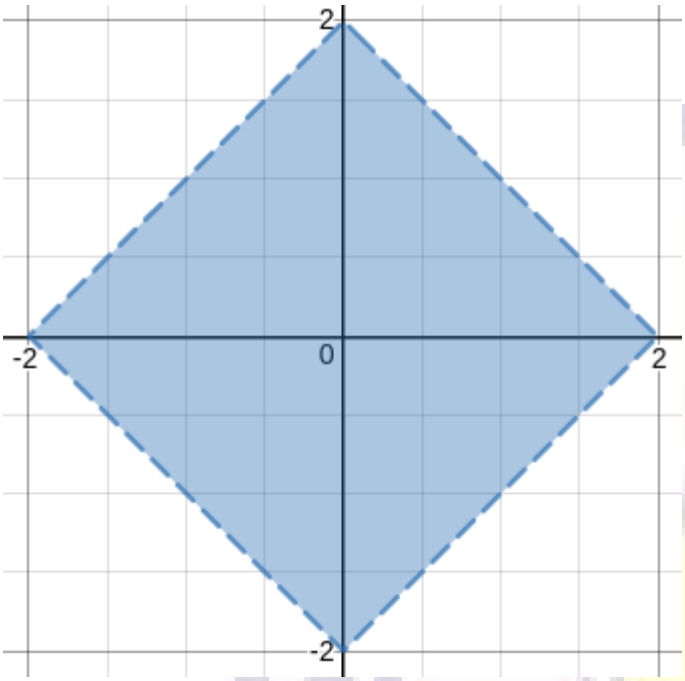
A. 0.96

B. 1.96

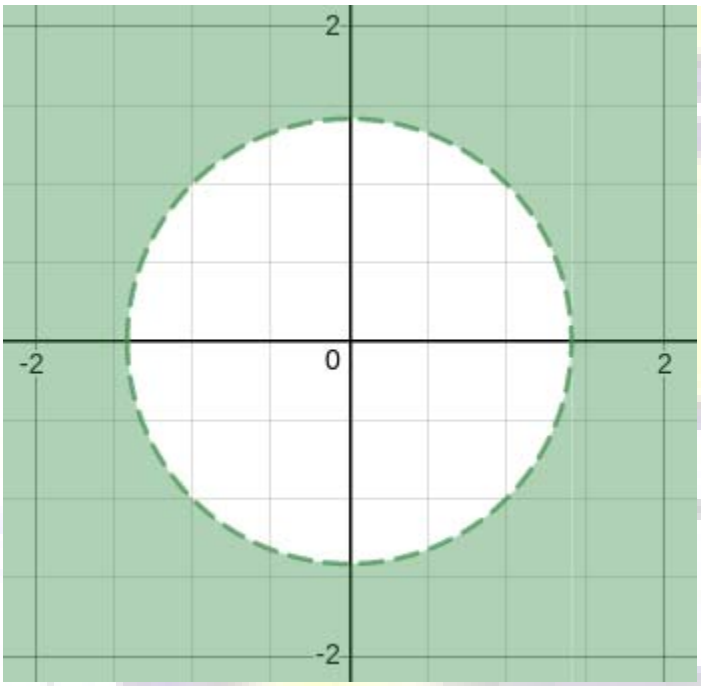
C. 1.72

D. 0.576

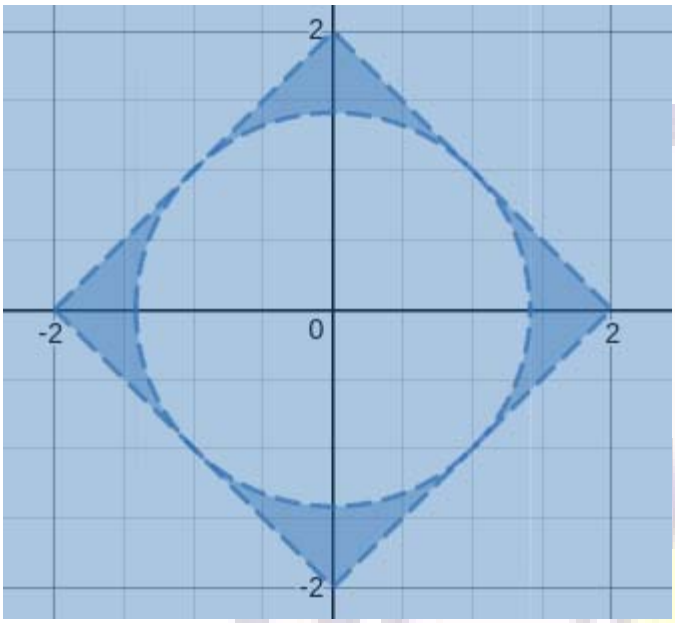
Sol. The first graph can be drawn by only visualizing the first quadrant and then extending it as a reflection across all the axes.



The second one is a circle.



When we plot them together, they touch each other at four distinct points.



To calculate the area, we need to subtract the area of the circle from the area of the square.
Hence, we get the area as

Area = $\left(2\sqrt{2}\right)^2 - \pi\left(\sqrt{2}\right)^2 = 8 - 2\pi = 8 - 6.28 = 1.72$

48. A alone can complete the work in 'x' days. B is 40% more efficient than A, and C is $\frac{3}{7}$ times less efficient than B. A, B and C together can complete the work in 'y' days. If x and y are natural numbers, find the minimum possible time taken by A and C to finish the work.

A. $8\frac{8}{9}$ days

B. $11\frac{1}{9}$ days

C. $9\frac{1}{11}$ days

D. $6\frac{2}{3}$ days

Sol. Let k_a be the efficiency of A, k_b be the efficiency of B and k_c be the efficiency of C
It is given,

$k_b = \frac{7}{5} k_a$ and $k_c = \frac{4}{7} k_b = \frac{4}{5} k_a$

Efficiency is inversely proportional to time taken.
Let the time taken by A to complete the work be 'x' days

Time taken by B = $\frac{5x}{7}$ and time taken by C = $\frac{5x}{4}$

Let the total work to be done be '5x' units
Work done by A in 1 day = 5 units
Work done by B in 1 day = 7 units
Work done by C in 1 day = 4 units
It is given that A, B and C together can complete the work in y days, i.e.
(5+7+4)y = 5x
16y = 5x
It is given that A, B and C complete the work in the minimum possible time
Therefore, y = 5 and x = 16
A can complete the work in 16 days, and C can complete the work in 20 days.

A and C can complete the work in $\frac{80}{9} = 8\frac{8}{9}$ days.
Answer is option A.

49. Kartikey leaves his home at a certain time every day and walks to the railway station. When he walks at his usual speed, he reaches the station at 10:40 AM. One day, he travels half the distance with a speed that is 25% more than his usual speed, and the rest of the distance at a speed that is 100% more than his usual speed. If he reaches the station at 10:19 AM, when does he leave for the station?
A. 10:05 AM
B. 10:00 AM
C. 9:40 AM
D. 9:45 AM

Sol. Let the total time that he takes be 2t.
Now, while traveling the first half, his speed is 1.25 times his usual speed.
Hence time taken = $\frac{t}{1.25}$ = 0.8t
Now, while traveling the second half, his speed is 2 times his usual speed.
Hence time taken = $\frac{t}{2}$ = 0.5t
Total = 1.3t
Time is decreased by 0.7t and it is known that he reached 21 minutes early
Therefore, 0.7t = 21 min
t = 30 min
2t = 60 min
Hence, he starts at 9:40 AM.

50. If a function f(x) is defined as f(x) = $\frac{x}{1-x}$, $f^n(x)$ is defined as f(f(f(....up to n times(x))), find out the value of $f^{21}(2)$.
A. 2/41
B. -2/41
C. -2/43
D. 2/43

Sol. $f^1(x) = f(x) = \frac{x}{1-x}$

$f^2(x) = f\left(f(x)\right) = f\left(\frac{x}{1-x}\right) = \frac{\frac{x}{1-x}}{1-\frac{x}{1-x}} = \frac{x}{1-2x}$

$f^3(x) = f\left(f^2(x)\right) = f\left(\frac{x}{1-2x}\right) = \frac{\frac{x}{1-2x}}{1-\frac{x}{1-2x}} = \frac{x}{1-3x}$

....
....
....

$f^{21}(x) = \frac{x}{1-21x}$

$f^{21}(2) = \frac{2}{1-21\times2} = -\frac{2}{41}$

51. If α and β are the roots of the equation x^2 - 8x – 120 = 0 and $a_n = \alpha_n + \beta_n$, then find the value of $\frac{(a_{20}-8a_{19})}{4a_{18}}$ is

A. 240
B. 120
C. 60
D. 30

Sol. Since α and β are the roots of the equation $x^2 - 8x - 120 = 0$, we can replace x with α and β.
$\alpha^2 - 8\alpha - 120 = 0$
$\alpha^2 - 8\alpha - 120$ – Equation (1)
Now we multiply equation(1) with α^{18}
We get, $\alpha^{20} - 8\alpha^{19} = 120\alpha^{18}$ – Equation (2)
Similarly we can replace β with x
$\beta^2 - 8\beta - 120 = 0$
$\beta^2 - 8\beta - 120$ – Equation (3)
Now we multiply equation(3) with β^{18}
We get, $\beta^{20} - 8\beta^{19} = 120\beta^{18}$ – Equation (4)
Now add equation (2) and (4)
$(\alpha^{20} - 8\alpha^{19}) + (\beta^{20} - 8\beta^{19}) = 120\alpha^{18} + 120\beta^{18}$
$(\alpha^{20} - \beta^{20}) - 8(\alpha^{19} - \beta^{19}) = 120(\alpha^{18} + \beta^{18})$
$\alpha^{20} = \alpha^{20} + \beta^{20}$, $\alpha^{19} = \alpha^{19} + \beta^{19}$, $\alpha^{18} = \alpha^{18} + \beta^{18}$
So we get $a_{20} - 8a_{19} = 120a_{18}$
Therefore $\frac{(a_{20} - 8a_{19})}{4a_{18}} = 30$

52. The total cost of 1 apple, 3 mangoes and 2 oranges is equal to the total cost of 4 apples and 2 oranges which is 294. Find the total cost of 7 apples, 7 mangoes and 7 oranges. Enter -1 if the answer can not be determined.

Sol. Let the cost of 1 apple be a
Let the cost of 1 mango be b
Let the cost of 1 orange be c
Now, a + 3b + 2c = 4a + 2c = 294
3b = 3a
b = a
4a + 2c = 294
2a + c = 147
We need to find the total cost of 7 apples, 7 mangoes and 7 oranges
So 7a + 7b + 7c = 14a + 7c (since a=b)
7 (2a + c) = 7 × 147 = 1029

53. If the radius and the height of a cylinder increase by the same percentage and the curved surface area doubles as a result of this change, find out the percentage increase in the volume of the cylinder.
A. 282%
B. 182%
C. 82%
D. 241%

Sol. Let the height and radius originally be h and r.
Let the changed h and r be H and R.
Now,

$2\pi RH = 2 \times 2\pi rh$
RH = 2 rh
Since the percentage change is the same,
$R = \sqrt{2}\, r$
$H = \sqrt{2}$ h
Hence, volume = $\pi R^2H = \pi (\sqrt{2})^3 r^2h = 2\sqrt{2}\pi r^2h$
Change in volume = $\frac{2\sqrt{2}-1}{1} \times 100\% = 1.828 \times 100\% = 182.8\%$

54. A shopkeeper buys 2y dozen of eggs and marks them up by 50%, and then gives a discount of 10% on each egg. If 6y eggs are destroyed and can not be sold, what is the effective profit/loss percentage in the process?
A. Loss 2.5%
B. Profit 5%
C. Loss 5%
D. Profit 1.25%

Sol. Let the cost of each egg be Re. 1.
Marked price = Rs 1.5
Selling price = 0.9 × 1.5 = Rs 1.35
Now, the total cost of all eggs = 24y
Number of eggs left = 18y
Cost price of all eggs = 24y
Selling price of eggs = 18y x 1.35 = 24.3y
Profit % = $\frac{0.3y}{24y} \times 100 = 1.25\%$
Answer is option D.

55. A wheel with a radius of 70 cm completes 100 full circles in 11 seconds. In what time (in seconds) will it travel a distance of 11 km?

Sol. Distance covered in one cycle = $2 \times \frac{22}{7} \times 0.7 = 4.4m$
Total distance covered in 100 cycles = 100 × 4.4 = 440 m
Time taken = 11 s
Hence, 40 metres is travelled in 1 second.
One km is travelled in 25 seconds.
11 km is travelled in 11 × 25 = 275 seconds

56. In what ratio should a 35% ethyl alcohol solution be mixed with a 49% methyl alcohol solution such that the ratio of ethyl alcohol and water is 49:142?
A. 5 : 7
B. 7 : 5
C. 7 : 6
D. 7 : 8

Sol. Let us mix 100x of solution 1 and 100y of solution 2.
Now, total ethyl alcohol = 35x
Total water = 65x + 51y
$\frac{35x}{65x+51y} = \frac{49}{142}$

Hence, $\frac{5x}{65x+51y} = \frac{7}{142}$
710x = 455x + 357y
255x = 357y
85x = 119y
5x = 7y
x : y = 7 : 5

57. If a number is represented as 270 in base N and 113 in base X. What is the total number of factors of the given number if X - N = 8?

Sol. X - N = 8
Thus, X = N + 8
The number is 270 in base N and 113 in base (N + 8).
$2(N)^2 + 7(N) + 0 = 1(N + 8)^2 + 1(N + 8) + 3$
$2N^2 + 7N = N^2 + 64 + 16N + N + 8 + 3$
$2N^2 + 7N = N^2 + 17N + 75$
$N^2 - 10N - 75 = 0$
$N^2 - 15N + 5N - 75 = 0$
(N - 15)(N + 5) = 0
N = 15 or N = -5
Since the base cannot be negative, N = 15
Thus, the required number is = $2(15)^2 + 7(15) = 2 \times 225 + 105 = 555$
555 = 5 x 3 x 37
Thus, the total number of factors of 555 = (1 + 1) (1 + 1) (1 + 1) = 8

58. What is the probability that if a word is chosen from all permutations of 'ALGEBRA', we get a word in which all the vowels are together?
A. 1/7
B. 2/7
C. 1/14
D. 3/14

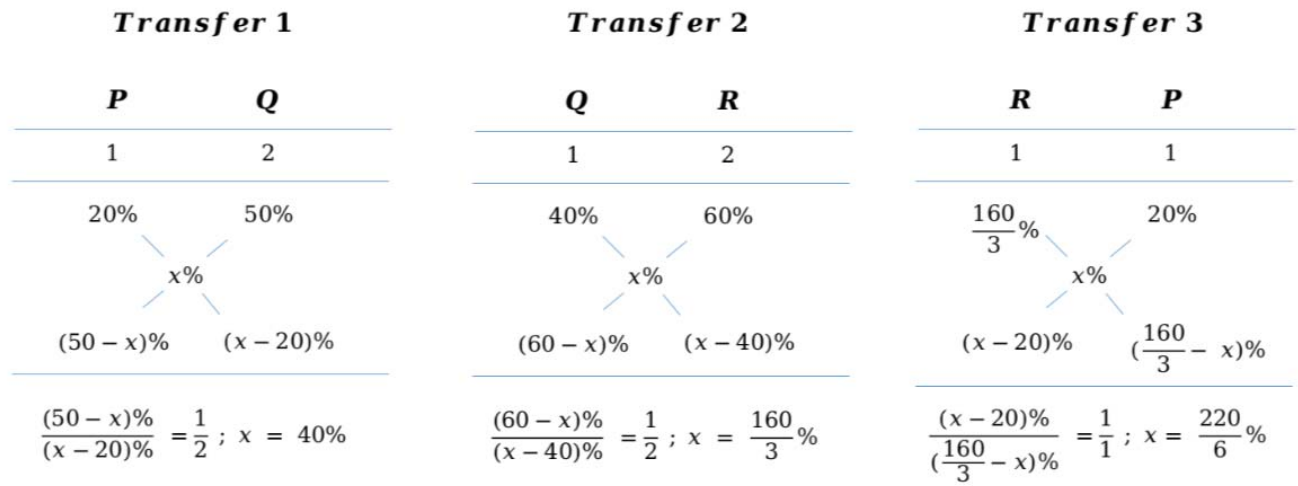
Sol. For calculating the total number of permutations, we need to divide the factorial of the total number of characters by the factorial of the count of repeated occurrence. The total number of permutations = $\frac{7!}{2!}$
For keeping vowels together, we consider all 3 of them as a block and then multiply it with the number of ways in which they can arrange themselves. The total number of words in which the vowels are together = $5! \times \frac{3!}{2!}$
Probability = $\frac{\frac{5! \times 3!}{2!}}{\frac{7!}{2!}} = \frac{1}{7}$
Answer is option A.

59. Find out the reflection of point P (4,11) on line x + y = 0.
A. (-11,-4)
B. (11,-4)
C. (-4,-11)
D. (11,4)

Sol. To find the reflection on a line, we first write down the equation of the line perpendicular to that line.
Line perpendicular to x + y = 0 is x - y = c
Putting (4, 11) on the line, we get the value of c as -7
Hence, x - y = -7
Now, we need the foot of the perpendicular on x + y = 0 from (4,11).
We can get that by finding out the point of intersection of the perpendicular lines.
y = 3.5, x = -3.5
Now, to find the reflection, we consider (4,11) as one end of a segment, the foot of the perpendicular as the centre and find out the reflection as the other end of the segment. Let the coordinates be h and k.
Hence, $\frac{h+4}{2}$ = - 3.5 --> h = -11
$\frac{k+11}{2}$ = 3.5 --> k = -4
Hence, the reflection is (-11, -4).
Alternate method 1:
When we have to find the reflection on x + y = 0, we just need to interchange the coordinates with a negative sign to each of them.
(4,11) ----> (-11, -4)
Alternate method 2:
To find the coordinates of the image or reflection of a point (p,q) about a line (ax+by+c=0) we can use the formula $\frac{(x-p)}{a} = \frac{(y-q)}{b} = -\frac{2(ap+bq+c)}{a^2+b^2}$
Substituting the p = 4, q = 11, a = 1, b = 1, c = 0 in the above equation we get
$\frac{(x-4)}{1} = \frac{(y-11)}{1} = -\frac{2(4+11+0)}{1+1}$
(x-4) = (y-11)= - 15
On solving we get x = -11 and y = -4
Hence, the coordinates of the reflection point are (-11, -4).

60. Three beakers - P, Q and R - each contain eight litres of 20%, 50% and 60% acid solution respectively. A bored chemist decides to pass time by mixing the solutions in a specific order: he transfers four litres of solution from beaker P to beaker Q. Next, he transfers four litres of liquid from beaker Q to beaker R. Finally, he transfers four litres from beaker R to beaker P and notes down the final concentration in beaker P. What is the ratio of acid to the water in the resultant solution?
A. 29:31
B. 17:23
C. 11:19
D. 7:13

Sol. The solutions in beaker P and Q are mixed in the ratio of 1:2. Using alligation, we determine that the resultant solution (after Transfer 1) has a concentration of 40%40 [see the given figure]. Four litres of this 40% solution is then added to beaker R (Transfer 2), thereby creating a solution with a concentration of $\frac{160}{3}$ %. Finally, the four litres of the solution in R is mixed with the remaining four litres of solution in beaker P (Transfer 3). Thus, we are left with a solution having a concentration of $\frac{220}{6}$ %. Simplifying this to obtain a ratio: $\frac{220}{600} = \frac{11}{30}$. Therefore, the ratio of acid to water = 11:19. Option C is the correct choice.



61. If the total sum of internal angles of a regular polygon is 2720 degrees more than the value of an internal angle, find out the value of an external angle of the polygon.

A. 30 degrees
B. 20 degrees
C.18 degrees
D. 36 degrees

Sol. The sum of internal angles = (n-2) 180
Each internal angle = $\frac{n-2}{n}180$
$\frac{n-2}{n}180 + 2720 = (n-2)180$
$(n-2)180\left[1-\frac{1}{n}\right] = 2720$
$[n-2]\left[\frac{n-1}{n}\right] = \frac{272}{18} = \frac{136}{9}$
9(n-2) (n-1)=136n
$9n^2$-27n+18=136n
$9n^2$-163n+18=0
(9n-1)(n-18)=0
n=18
Hence, external angle = $\frac{360}{18}$ = 20 degrees

62. If $[\log_2 x] + [\log_2 (x + 1)] = 3$, where [x] is the greatest integer less than equal to x, find out the value of [x]. Enter -1 if [x] cannot be determined or multiple values exist for [x].

Sol. $[\log_2 x] + [\log_2 (x + 1)] = 3$
Now, if we see, the two terms on the left can either be equal or differ by 1 and are both integers.
If the RHS is 3, then, definitely the LHS should have 1 and 2.
Hence, the left part should give 1 and the right part should give 2.
$[\log_2 x] = 1$
$[\log_2 (x+1)] = 2$
This is only possible when $3 \leq x < 4$
Hence, [x] = 3.

63. If three inlet pipes can fill a tank in 3 hours and four outlet pipes can empty a tank in 4 hours, in approximately how many hours can four inlet pipes and three outlet pipes fill the tank?
A. 5
B. 3
C. 4
D. 6

Sol. An inlet pipe takes 9 hours to fill the tank.
An outlet pipe takes 16 hours to empty the tank.
Let the total number of units to be filled = L.C.M(9,16) = 144 units
Hence, an inlet pipe fills in 16 units in an hour and a outlet pipe empties 9 units in an hour.
In one hour, amount of tank filled by four inlet pipes and 3 outlet pipes = 4 x 16 - 3 x 9 = 64 - 27 = 37.
To fill the tank, we need $\frac{144}{37}$ = 3.89 hours = 4 hours.

64. A certain good when sold at a discount of 25% yields a profit of x% and when sold at a discount of 50%, yields a profit of x/2%. What is the markup percentage on the price of the good?
A. 250%
B. 200%
C. 400%
D. 300%

Sol. Let the cost price be 100 and the marked-up percentage be y.
MP = 100 + y
Case 1: SP = 100 + x = (100 + y)0.75
Case 2: SP = 100 + $\frac{x}{2}$ = (100 + y)0.5
So, (100 +y)0.75 - 100 = 2 [(100 + y)0.5 - 100]
(100 + y) 0.75 - 100 = (100 + y) - 200
(100 + y)0.25 = 100
100 + y = 400
y = 300%
Answer is option D.

65. Aman, a dishonest merchant, uses the same faulty weighing machine while purchasing and selling his commodities. The machine weighs 800 gm as a Kg. Unfortunately, owing to a fire incident in his godown, 40 percent of the goods got damaged. If he sold the damaged good at a 50 percent discount on the normal cost price and marked up the remaining good by 25 percent on the same, find his approximate profit/loss percentage?
A. 15% profit
B. 42.5% loss
C. 42.5% profit
D. 5% loss

Sol. Since the machine weighs 800gm as a kg, and he is using the same machine while purchasing and selling, he is not generating any profit from this transaction.
Now, 40 percent of good us sold at 50 percent loss.
If the price of total good were 100 rupee, 40% will be sold at 20 rupee.

Since the remaining portion is sold at 25% marked up price, 60% will be sold at 75 rupee.
Thus, selling price = 95 rupee
Cost price = 100 rupee
Loss = 5 rupee and loss percent = 5%.
Thus, the correct answer is D

66. What is the probability to get a sum of 8 in the roll of 3 dice?

A. $\frac{7}{72}$
B. $\frac{1}{12}$
C. $\frac{1}{9}$
D. $\frac{1}{6}$

Sol. A sum of 8 is possible in the following ways:
1, 1, 6 - Number of ways = 3
1, 2, 5 - Number of ways = 3!
1, 3, 4 - Number of ways = 3!
2, 2, 4 - Number of ways = 3
2, 3, 3 - Number of ways = 3
Total number of ways = 21
Probability = $\frac{21}{216} = \frac{7}{72}$
Answer is option A.