DASH CAT 7

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Instructions

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

From roughly the mid-Fourteenth through the late Sixteenth centuries, many of the leading scholars of Europe were engaged in attempting to recover the high levels of skills and learning that characterized late classical antiquity. Humanists trained in the ancient languages sought to recover texts which had been lost or ignored for a millennium or more. We owe the very concept of the "Middle Ages" (not to mention the more pejorative notion of the "dark ages") to this movement. Patrizi's early mastery of Greek and his interest in assembling a library of classical Greek manuscripts (Muccillo 1993) places him well within the tradition of seeking to restore the legacy of antiquity as a precondition for moving ahead to a "new" era.

Aristotle's works had, of course, been made available to scholars via translation from Greek and Arabic sources during the medieval period (Twelfth through Fourteenth centuries), and a familiarity with Aristotle's logic and natural philosophy became a requirement for an Arts degree at medieval universities and thus an integral part of the training of those who wished to pursue advanced studies in medicine, theology or canon or civil law. But the number of philosophers or theologians who could access the Aristotelian corpus in the original Greek was quite small, and there was an extensive body of works in Greek devoted to commentaries and criticisms of the Stagirite's positions that would not become available to a majority of readers until the Renaissance provided accessible translations. It is not surprising that Patrizi devoted much of his time and effort to these endeavors, and his doing so would have a profound effect on the way in which he and many of his contemporaries and successors would come to interpret the Peripatetic system.

It is perhaps significant that Patrizi's earliest works, produced while he was still in close contact with teachers and colleagues at Padua, reveal a far less critical view of Aristotle and his doctrines than his later writings would, generally attempting to utilize Plato and other earlier thinkers to complement rather than refute Peripatetic positions. In this regard, it is quite likely that Patrizi may be said to have undergone a philosophical development from an earlier, more sympathetic, view of Aristotle's philosophy to a more critical attitude as his familiarity with Platonic and other earlier sources increased and he became aware of the debates among the contemporary Aristotelians themselves, such as Pietro Pomponazzi and Agostino Nifo, over such basic doctrines as the immortality of the soul and the nature of the physical cosmos. Add to this the ongoing exchanges he had with thinkers committed to developing a philosophical and scientific method outside both the Platonic and Aristotelian "mainstreams" and it becomes clear why Patrizi came to play the major role he did in the move from an entrenched Peripatetic approach to the search for a "new" method which would come to characterize the leading philosophers and scientists of the Seventeenth Century and beyond.

1. Which of the following best describes the 'precondition' mentioned in the first paragraph?

A. Keeping in touch with the ancestral history and heritage while progressing forward.

B. Using ancient wisdom and learnings to usher in new and better times.

C. Restore familial history while looking out for the next generation.

D. Moving into a new era while being reminiscent of one's past.

Sol. In the first paragraph, it has been mentioned that scholars attempted to revive ancient skills and learnings. Patrizi was one of them and espoused that to move ahead to a new era, we needed to restore the abovementioned legacy. This was the precondition cited in the question.

Option B comes the closest to capturing this idea. Hence, Option B is the correct answer.

A: Keeping in touch is too weak. Patrizi espoused a revival of the knowledge of those times.

C: The scope of this option is too narrow, and focuses only on the familial history.

D: Merely being reminiscent is not what the precondition is.

2. Which of the following can be considered a valid statement based on the information provided in the passage?

A. Given his mastery of Greek and his effort toward creating a library of classical Greek manuscripts, Patrizi was at the forefront of the movement that was attempting to revive the legacy of the late classical antiquity period.

B. Before the Renaissance, the Aristotelian corpus in the original Greek remained accessible but to a few elite philosophers and theologians, and it was Patrizi who changed the status quo by strenuously endeavouring to produce translations.

C. The contemptuous view of the dark ages stemmed partly from the efforts of many leading scholars (from the mid-14th through the late 16th centuries) to revitalise the high levels of skills and learning that marked late classical antiquity.

D. In the early stages of his philosophical journey, Patrizi often utilised the philosophical arguments of Plato and other contemporaries of Aristotle to undermine the Peripatetic approach.

Sol. Option A: We cannot deduce if Patrizi was at the 'forefront' of this movement. The author merely asserts that given "Patrizi's early mastery of Greek and his interest in assembling a library of classical Greek manuscripts," we can consider him a part of this movement.

Option B: The phrase 'a **few elite** philosophers and theologians' marks a distortion, and thus, we can reject this choice.

Option C: The statement here can be inferred from the following excerpt: {...From roughly the mid-Fourteenth through the late Sixteenth centuries, many of the leading scholars of Europe were engaged in attempting to recover the high levels of skills and learning that characterized late classical antiquity...We **owe** the very concept of the “Middle Ages” (not to mention the **more pejorative notion of the “dark ages”**) to **this movement**...}

Option D: This cannot be considered to be a valid statement. If anything, the author states that teachings from Plato were used to '**complement rather than refute Peripatetic positions**'. Thus, we can eliminate this option.

Hence, the correct answer is Option C.

3. The change in Patrizi's attitude towards the Peripatetic approach can be attributed to

A. an increased familiarity with Plato's philosophical works, enabling him to identify deficiencies in the entrenched Peripatetic approach and consequently discern the need for a "new" method.

B. an urge to replace the entrenched, overused Aristotelian system with a more pragmatic "new" method based on Platonic doctrines and derived from the discussions among the contemporary Aristotelians.

C. the enhanced awareness regarding the debates among the contemporary Aristotelians themselves over pertinent basic doctrines such as the immortality of the soul and the nature of the physical cosmos.

D. an increasing understanding of Platonic discourses coupled with relevant discussions with his own contemporaries who were looking to develop methods beyond the existing mainstream approaches.

Sol. {...In this regard, it is quite likely that Patrizi may be said to have undergone a philosophical development from an earlier, more sympathetic, view of Aristotle's philosophy to a more critical attitude **as his familiarity with Platonic and other earlier sources increased and he became aware of the debates among the contemporary Aristotelians themselves**, such as Pietro Pomponazzi and Agostino Nifo, over such basic doctrines as the immortality of the soul and the nature of the physical cosmos. **Add to this the ongoing exchanges he had with thinkers committed to developing a philosophical and scientific method outside both the Platonic and Aristotelian "mainstreams"** and it becomes clear why Patrizi came to play the major role he did...} The author puts forward two reasons explaining Patrizi's change in attitude towards the Peripatetic approach. Option D aptly captures these reasons.

Options A and C fail to capture the entire picture and focus on a specific subpoint among the listed reasons. Thus, these choices can be eliminated. Option B is not stated or implied in the passage.

Hence, Option D is the correct choice.

4. Which of the following is the main idea of the passage?

A. Patrizi's endeavours in translating and evaluating classical Greek manuscripts profoundly affected the philosophical thought of his times and beyond.

B. Patrizi's endorsement and later repudiation of Aristotlean works profoundly impacted how he and his contemporaries viewed the Peripatetic philosophical approach.

C. Patrizi translated and reclaimed classical Greek manuscripts from the verge of obscurity and brought back the Peripatetic system of thought into the philosophical mainstream.

D. The Peripatetic approach, researched and reclaimed by Patrizi, shaped the new era of Philosophy from the seventeenth century and beyond.

Sol. The author introduces the idea of restoring ancient knowledge and, with that context, introduces Patrizi's work in translating classical Greek manuscripts. The author describes how the works of Greek philosophers were inaccessible to most philosophers, and how due to Patrizi's efforts, they became accessible. In the final paragraph, the author notes how Patrizi's own views on the Aristotlean work evolved with greater exposure to other works from that time and through debates with other thinkers. Thus, the author, through the passage, showcases Patrizi's efforts in reviving and restoring Greek philosophical literature and how this restoration impacted the philosophical thought of those times. Only option A captures the point and hence is the right answer.

Option B introduces the distortion of endorsement and repudiation. From the passage, we can infer that Patrizi initially had a sympathetic view and later a less sympathetic one. But endorsement and repudiation would be a gross exaggeration.

Option C contains the distortion that the Peripatetic system was introduced into the philosophical mainstream.

Option D misses the main focus of the passage - Patrizi's efforts in restoring Greek philosophical work.

Instructions

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

Almost 2,700 years ago, a Babylonian astronomer wrote on a clay tablet the observations he had just made from the top of the ziggurat: 'The Sun and Moon were in opposition at sunset, Mercury had its last appearance in Pisces (before disappearing behind the Sun) and Saturn also had its last appearance in Pisces.' Glancing at the overcast skies, the writer added: 'The day was cloudy, I did not watch.'

So many thousands of years ago and with no instrumentation other than eyes and mind, and despite cloudy weather, this astronomer produced an accurate observation of two planets. What does it mean to record an observation that you did not actually see?

The way in which we see the world is as much a product of the stimuli generated by our optic nerve as by our mental models of how things work. Astronomical records from ancient Mesopotamia give us the first evidence in history of scientific observation as a way of seeing dependent on theoretical understanding. We can begin to gain a better appreciation of the history of the relationship between observation and theory from the records left by the highly skilled astronomers of ancient Babylonia. They wrote thousands of cuneiform tablets in ancient Mesopotamia, which were buried for millennia. Modern translations of their work give us a window into a highly technical practice of observing the sky with ancient eyes and complex theory, or in other words the practice of celestial 'observation'.

Babylonian astronomers ... were the inheritors of thousands of years of scholarship and theory about the sky above them. To note that they watched the sky religiously is not a pithy antiquated characterisation of their work, but a matter-of-fact description of their theoretical conception of the world: the planets as gods moved through the heavens by divine design.

There is no way to separate religion and science in the ancient world. Their observational practice was recorded on clay tablets called 'regular watching', which compiled together hundreds of years of records about movement in the sky, water level in the rivers, economic prices and historical events. They also wrote procedural and theoretical works about how to calculate the movement of planets and, importantly, the meaning behind their appearance in certain places of the sky (i.e., astrology)...

As far as we know, astronomers of ancient Mesopotamia lacked any instrumentation that would make sighting objects in the sky any easier than naked-eye astronomy. They worked only with their eyes and the theoretical knowledge in which they had spent most of their lives training. And here is the crux of the historical and theoretical problem: how did their sense of sight interact with their (highly trained) sense of astronomical movement? Modern scientists in lab settings do something similar; they read instrumentation or observe colour change and impute

scientific knowledge from the sensory data combined with their theoretical understanding of the conditions ... Another example, closer to the work of ancient astronomers, is the understanding of redshift (ie, the increase in wavelength as objects move apart) as determining the relative speed of objects in our galaxy. Colour perception, as recorded by the eyes of the observer, is used as the input data for a theoretical understanding of how wavelength and frequency change, based on relative velocity.

5. Through the first three paragraphs, the author intends to

A. emphasise how ancient Mesopotamian astronomers were able to present accurate celestial findings by merely observing the sky and correlating these observations to theoretical ideas.

B. highlight the role of astronomical records from ancient Mesopotamia in offering insights into the relationship between theoretical knowledge and the technical practice of observation.

C. demonstrate an instance in the history of scientific observation wherein accurate observations were made by simply using sensory information and without any instruments.

D. cite the astronomical records from ancient Mesopotamia to mark the first evidence in the history of scientific observation wherein findings are based on theoretical knowledge instead of sight.

Sol. Pay heed to the following excerpt: {Astronomical records from ancient Mesopotamia give us the first evidence in history of scientific observation as a way of seeing dependent on the theoretical understanding. We can begin to gain a better appreciation of the history of the relationship between observation and theory from the records left by the highly skilled astronomers of ancient Babylonia. They wrote thousands of cuneiform tablets in ancient Mesopotamia, which were buried for millennia. Modern translations of their work give us a window into a highly technical practice of observing the sky with ancient eyes and complex theory, or in other words the practice of celestial 'observation'.}

Initially, the author sets the context by discussing an anecdote related to a Babylonian astronomer and his observations. He highlights the remarkable nature of these observations given that they were made without the aid of any instrument. Subsequently, in the third paragraph, the author focuses on the relationship between theoretical knowledge and the way in which visual observations supplement it. He then states the significance of ancient astronomical records from Mesopotamia in offering insights into this relationship. Thus, through the first three paragraphs, the author highlights the role of astronomical records from ancient Mesopotamia in offering insights into the relationship between theoretical knowledge and the technical practice of observation. Option B correctly captures this.

Options A and C, though true, capture just a part of the initial discussion. The idea in Option A is what these ancient records convey and hence, their immense value. Similarly, although Option C is true, it strays from the main point.

Option D distorts what is given in the passage by claiming these are the first pieces of evidence in the history of scientific observation.

6. Which of the following can be inferred as true based on information provided in the passage?

A. The methodology used by ancient Mesopotamian astronomers to develop scientific knowledge is quite akin to the processes that modern scientists follow.

B. The superimposition of religion on scientific principles allowed Babylonian astronomers to develop an accurate representation of our solar system.

C. For astronomers in ancient Mesopotamia, their worldview was shaped purely by their sensory perception of physical phenomena.

D. Ancient Babylonian astronomers used to train their sense of sight alongside their sense of astronomical movement.

Sol. Option A: We can infer A from the following excerpts:

- {The way in which we see the world is as much a product of the stimuli generated by our optic nerve as by our mental models of how things work. Astronomical records from ancient Mesopotamia give us the first evidence in history of scientific observation as a way of seeing dependent on theoretical understanding. We can begin to gain a better appreciation of the history of the relationship between observation and theory from the records left by the highly skilled astronomers of ancient Babylonia.}
- {Modern scientists in lab settings do something similar; they read instrumentation or observe colour change and impute scientific knowledge from the sensory data combined with their theoretical understanding of the conditions}

Options B and D: No mention of these ideas in the passage. Option B introduces a false cause-effect relationship between Babylonians following astronomy as a religious practice and its scientific development.

Option C: The statement here would be invalid since the author mentions how visual information supplemented the theoretical knowledge possessed by the astronomers.

Hence, Option A is the correct choice.

7. Which of the following best sums up the idea conveyed by the lines: "...the planets as gods moved through the heavens by divine design..."?

A. Astronomers religiously undertook scientific observations.

B. The theoretical conception of celestial bodies was derived from religion.

C. Scientific ideas were coincident with religious concepts.

D. Planetary motion was analogous to the movements of divine beings.

Sol. In the fourth and fifth paragraph, the author highlights how religion and science were not separate in ancient Mesopotamia: {To note that they watched the sky religiously is not a pithy antiquated characterisation of their work, but a matter-of-fact description of their theoretical conception of the world: the planets as gods moved through the heavens by divine design...There is no way to separate religion and science in the ancient world.} He mentions how the concept of celestial motion was perceived as the movement of the gods through the

heavens. Thus, the intention here is to showcase how scientific ideas were coincident with religious concepts. Option C captures this correctly.

Options A, B and D are misinterpretations.

8. The author cites the example of 'redshift'

A. to present the correlation between wavelength and the relative speed of objects in the galaxy.

B. to emphasise the similarity in the approach of ancient astronomers and modern scientists.

C. to illustrate how wavelength and frequency change was used as input data to calculate relative velocity.

D. to show how visual information was used to supplement theoretical understanding.

Sol. Pay heed to the following excerpt: {Another example, closer to the work of ancient astronomers, is the understanding of redshift (ie, the increase in wavelength as objects move apart) as determining the relative speed of objects in our galaxy. **Colour perception, as recorded by the eyes of the observer, is used as the input data for a theoretical understanding of how wavelength and frequency change, based on relative velocity.**}

The author emphasises how observations aided theoretical knowledge. He states how visual cues serve as 'input data' for a theoretical understanding of certain phenomena. Option D comes closest to capturing this idea.

Instructions

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

Ramaswamy says his new firm, Strive, will aim to limit the Big Three's power through competition. If Strive attracts enough investors to gain a say in how companies are run — a huge "if," considering that Ramaswamy has said that Strive has raised only about $20 million compared with the trillions managed by the Big Three — Ramaswamy says that he will push for companies to focus on "excellence" rather than wading into heated political issues.

But the goal of staying out of politics in 2022 is about as realistic as staying dry in a hurricane. Last year, for example, BlackRock, Vanguard and State Street supported a successful effort to shake up the board of Exxon Mobil by installing new members who promised to take climate change more seriously. Was that because of excessive wokeness, as Ramaswamy says, or because Exxon Mobil had been underperforming its peers for several years, and it was woefully ill prepared for the transition to renewable energy that has been transforming energy markets? The move seems well within what the investment firms say is their main goal, looking out for the long-term interest of shareholders. And what if the firms hadn't backed the climate initiative — wouldn't that have been construed as a political decision by the activists who have called on shareholders to push corporations to address the climate? (In any case, BlackRock announced this week that it would most likely vote for fewer climate-related shareholder proposals in 2022 than it did in 2021.)

In late 2018, a few months before his death, John C. Bogle, the visionary founder of Vanguard who developed the first index fund for individual investors, published an extraordinary article in The Wall Street Journal assessing the impact of his life's work. The index fund had revolutionized Wall Street — but what happens, he wondered, "if it becomes too successful for its own good?"

Bogle pointed out that asset management is a business of scale — the more money that BlackRock or Vanguard or State Street manages, the more it can lower its fees for investors. This makes it difficult for new companies to enter the business, meaning that the Big Three's hold on the market seems likely to persist. "I do not believe that such concentration would serve the national interest," Bogle wrote. He outlined several ideas for limiting their power, but he pointed out problems with a number of them. For example, regulators could prohibit index funds from holding large positions in more than one company in a given industry. But how then would they offer an index fund that invested in all companies in the S&P 500, one of the most popular kinds of funds?

Coates, of Harvard, argues that policymakers will have to move carefully to manage the dangers of concentration without limiting the benefits to investors of these firms' low-cost funds. "No doubt getting the balance right will require judgment and experimentation," he wrote. But the most pressing issue is for us to recognize the problem. The growing influence of three large fund managers is not likely to diminish. Ramaswamy's take on the problem is wrong, but he's right that it's a problem. How much power do the three companies have to accumulate before we decide it's too much?

9. Which of the following statements can be inferred from the passage?

A. Due to their scale, the Big Three asset managers charge much lower fees than smaller asset managers.

B. Regulation preventing asset managers from holding too large a position in a company or an industry might make certain types of investment products infeasible.

C. Bogle, the founder of Vanguard, was concerned about the excessive influence wielded by the Big Three asset managers and proposed that they should be broken up.

D. Ramaswamy has become the primary competition to The Big Three for the control of the market.

Sol. A: "Bogle pointed out that asset management is a business of scale — the more money that BlackRock or Vanguard or State Street manages, the more it can lower its fees for investors." From this, we can infer that the big asset managers **can** charge lesser fees. But we cannot infer that the asset managers actually charge much lower fees than smaller firms. Hence, A cannot be inferred.

B: "For example, regulators could prohibit index funds from holding large positions in more than one company in a given industry. But how then would they offer an index fund that invested in all companies in the S&P 500, one of the most popular kinds of funds?" From this, we can infer option B.

C: In the passage, Bogle did not propose the idea of breaking up the Big Three. Hence, C can be eliminated.

D: It cannot be inferred that Ramaswamy has become significant enough to be considered the primary competition of the Big Three.

10. The author uses the example of Exxon Mobil to highlight that:

A. It is impossible for The Big Three to not factor in politics while taking decisions.

B. Companies are taking progressive decisions due to the increased pressure from stakeholders.

C. It is difficult to keep business from politics as decisions are construed as political either way.

D. It is impossible for Strive to keep business separated from politics due to certain inherent challenges.

Sol. But the goal of staying out of politics in 2022 is about as realistic as staying dry in a hurricane. Last year, for example, BlackRock, Vanguard and State Street supported a successful effort to shake up the board of Exxon Mobil by installing new members who promised to take climate change more seriously. Was that because of excessive wokeness, as Ramaswamy say.....And what if the firms hadn't backed the climate initiative — wouldn't that have been construed as a political decision by the activists who have called on shareholders to push corporations to address the climate?

In the above excerpt, the author makes the argument that it is difficult to separate business from politics. He introduces the example of Exxon Mobil, where decisions to favour/not favour climate action would have attracted the criticism of being political anyway. The author wanted to highlight this point through the example. Hence, Option C is the correct answer.

11. Which of the following statements is Strive's Ramaswamy least likely to agree with?

A. The move by BlackRock, Vanguard and State Street to rejig the Exxon Mobil board by installing new members could be perceived as a political decision and is reflective of their excessive wokeness.

B. Given the current status quo in the industry, curtailing the power of The Big Three has become a matter of urgency.

C. Instead of getting tangled in political matters, organisations should strive for excellence.

D. The administration needs to pass regulations after requisite experimentation to deal with the dangers of power concentration in the industry without limiting the benefits to investors.

Sol. Option A: The statement here aligns with Ramaswamy's take on the matter: {...BlackRock, Vanguard and State Street supported a successful effort to shake up the board of Exxon Mobil by installing new members who promised to take climate change more seriously. Was that because of **excessive wokeness, as Ramaswamy says**...}

Options B and C: can be understood from the first paragraph: {Ramaswamy says his new firm, **Strive, will aim to limit the Big Three's power through competition**. If Strive attracts enough investors to gain a say in how companies are run — a huge "if," considering that Ramaswamy has said that Strive has raised only about $20 million compared with the trillions managed by the Big Three — **Ramaswamy says that he will push for companies to focus on "excellence" rather than wading into heated political issue**s...}

Option D: We cannot definitively decipher Ramaswamy's take on the subject; if anything, Ramaswamy aims to deal with the power concentration via competition - his firm serves this purpose rather than any form of regulation.

Hence, Option D is the correct choice.

12. Why does the author say that 'Ramaswamy's take on the problem is wrong, but he's right that it's a problem'?

A. Although the author acknowledges that the power concentration among The Big Three is a problem, regulation - instead of a focus on competition or apoliticism - is the way forward.

B. Allowing The Big Three firms to grow larger hereon poses a significant threat to the industry's stability; however, Ramaswamy's Strive, which is part of the same industry, is unlikely to solve the issue.

C. Though the author agrees that making political decisions could come back to bite firms, Ramaswamy's belief that organisations should stay completely apolitical (and instead choose to focus on excellence) is misplaced.

D. While the author concurs that it is critical to carefully manage the dangers of concentration without limiting the benefits to investors, he does not believe in Ramaswamy's vision that Strive will limit the Big Three's power through competition.

Sol. Towards the end of the passage, the author states the following: {...But the most pressing issue is for us to recognize the problem. The growing influence of three large fund managers is not likely to diminish. Ramaswamy's take on the problem is wrong, but he's right that it's a problem. How much power do the three companies have to accumulate before we decide it's too much? }

The author emphasises that the power concentration among The Big Three definitely poses a problem that must be dealt with. However, he disagrees with Ramaswamy's take on the subject, especially with regard to staying away from politics {But the goal of staying out of politics in 2022 is about as realistic as staying dry in a hurricane}. Instead, the author hints at how regulations could perhaps help us deal with this issue but under the condition that we find the right balance between reducing the power accumulation and the impact on benefits to investors. Option A correctly captures the author's belief.

Options B, C and D, are either distorted or not implied by the author in the passage.

Hence, the correct answer is Option A.

Instructions

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

Here's a simple recipe for doing science. Find a plausible theory for how some bits of the world behave, make predictions, test them experimentally. If the results fit the predictions, then the theory might describe what's really going on. If not, you need to think again. Scientific work is vastly diverse and full of fascinating complexities. Still, the recipe captures crucial features of how most of it has been done for the past few hundred years.

Now, however, there is a new ingredient. Computer simulation, only a few decades old, is transforming scientific projects as mind-bending as plotting the evolution of the cosmos, and as mundane as predicting traffic snarl-ups. What should we make of this scientific nouvelle cuisine? While it is related to experiment, all the action is in silico — not in the world, or even the lab. It might involve theory, transformed into equations, then computer code. Or it might just incorporate some rough approximations, which are good enough to get by with. Made digestible, the results affect us all.

As computer modelling has become essential to more and more areas of science, it has also become at least a partial guide to headline-grabbing policy issues, from flood control and the conserving of fish stocks, to climate change and — heaven help us — the economy. But do politicians and officials understand the limits of what these models can do? Are they all as good, or as bad, as each other? If not, how can we tell which is which?

Modelling is an old word in science, and the old uses remain. It can mean a way of thinking grounded in analogy — electricity as a fluid that flows, an atom as a miniature solar system. Or it can be more like the child's toy sense of model: an actual physical model of something that serves as an aid to thought. Recall James Watson in 1953 using first cardboard, then brass templates cut in the shape of the four bases in DNA so that he could shuffle them around and consider how they might fit together in what emerged as the double-helix model of the genetic material.

Computer models are different. They're often more complex, always more abstract and, crucially, they're dynamic. It is the dynamics that call for the computation. Somewhere in the model lies an equation or set of equations that represent how some variables are tied to others: change one quantity, and working through the mathematics will tell you how it affects the rest. In most systems, tracking such changes over time quickly overwhelms human powers of calculation. But with today's super-fast computers, such dynamic problems are becoming soluble. Just turn your model, whatever it is, into a system of equations, let the computer solve them over a given period, and, voila, you have a simulation.

In this new world of computer modelling, an oft-quoted remark made in the 1970s by the statistician George Box remains a useful rule of thumb: 'all models are wrong, but some are useful'. He meant, of course, that while the new simulations should never be mistaken for the real thing, their features might yet inform us about aspects of reality that matter.

13. The penultimate paragraph tries to

A. emphasise how computer modelling involves complex, abstract and dynamic elements that go beyond the current human ability to solve.

B. demonstrate how deploying computer simulations enables humans to solve problems that would otherwise be beyond the ability of human computation.

C. highlight how the current computer simulations differ from the older perception of modelling due to the presence of dynamic elements.

D. showcase how computer simulations model complex problems by turning a phenomenon into a system of equations that are then solved over a span of time.

Sol. In the antepenultimate paragraph, the author discusses the role of modelling in science: {Modelling is an old word in science, and the old uses remain. It can mean a way of thinking grounded in analogy — electricity as a fluid that flows, an atom as a miniature solar

system. Or it can be more like the child's toy sense of model: an actual physical model of something that serves as an aid to thought} He highlights how modelling has served as an aid to thought. At the same time, the author highlights the simplicity of earlier models. He highlights how these models were unsophisticated {made of cardboard cut-outs} yet insightful.

In the next paragraph, the author emphasises the utility of models but at the same time mentions the critical difference: the added presence of dynamic elements in the models. This can be understood from the first half of the penultimate paragraph: {Computer models are different. They're often more complex, always more abstract and, crucially, they're dynamic. It is the dynamics that call for the computation.}

Thus, the author is trying to capture this difference and, therefore, portray a unique feature of computer simulations. Option C aptly captures this idea.

14. Which of the following captures the essence of the first two paragraphs?

A. Although scientific projects have always followed the simple recipe involving theorisation and validation, computer simulations have now replaced these elements.

B. While most scientific work over the past centuries has followed a simple process, the introduction of computer simulations into this fold has been transformative.

C. Computer simulations are the new entrants in science and have cemented their place as an essential part of any scientific project involving theories and experiments.

D. The realm of science has been transformed due to the conception of computer simulations that enable us to undertake scientific projects of varying complexities.

Sol. In the first paragraph, the author states how scientific works over the past centuries have followed a simple recipe: theorise - experiment -validate - repeat. {Here's a simple recipe for doing science. Find a plausible theory for how some bits of the world behave, make predictions, test them experimentally. If the results fit the predictions, then the theory might describe what's really going on. If not, you need to think again. Scientific work is vastly diverse and full of fascinating complexities. Still, the recipe captures crucial features of how most of it has been done for the past few hundred years.}

Then the author adds that a new "ingredient" (computer simulation) has been added to this recipe. He also emphasises the importance of computer simulations {Now, however, there is a new ingredient. Computer simulation, only a few decades old, is transforming scientific projects as mind-bending as plotting the evolution of the cosmos, and as mundane as predicting traffic snarl-ups.}

Thus, through the first two paragraphs, the author highlights this new addition to an age-old recipe; Option B correctly captures this.

At no point does the author assert that computer simulations have "replaced" the earlier processes in scientific works. Hence, Option A is incorrect.

Options C and D are true, but miss out on the idea of computer simulation being a new "addition" to an already existing methodology.

15. According to the passage, which of the following best captures George Box's remark on computer modelling?

A. Most simulation models in this day and age are wrong, while only some are truly useful.

B. All simulation models, though faulty, closely replicate real-life phenomena.

C. Given that simulation models fail to offer insight into reality, we should not rely on them.

D. Though computer simulations may not render accurate answers, they provide useful insights into scientific work.

Sol. {In this new world of computer modelling, an oft-quoted remark made in the 1970s by the statistician George Box remains a useful rule of thumb: 'all models are wrong, but some are useful'. He meant, of course, **that while the new simulations should never be mistaken for the real thing, their features might yet inform us about aspects of reality that matter.**}

Hence, Box intended to highlight that while computer simulations may not be entirely accurate, they are definitely insightful. Option D correctly captures this without any distortion. Options A, B and C are misinterpretations.

16. All of the following are false EXCEPT:

A. Historically, modelling has served as an aid to thought in the scientific domain.

B. Most computer simulations offer rough approximations that further aid experimental studies.

C. The utility of simulation models is limited to unravelling complex phenomena.

D. Computer simulations are useful since tracking multiple changes in a dynamic system comprising a set of variables is beyond human capability.

Sol. Option A: This is true based on the following excerpt: {Modelling is an old word in science, and the old uses remain. It can mean a way of thinking grounded in analogy — electricity as a fluid that flows, an atom as a miniature solar system. Or it can be more like the child's toy sense of model: an actual physical model of something that serves as an aid to thought.}

Option B: This has not been stated in the passage.

Option C: The author states the opposite: {Computer simulation, only a few decades old, is transforming scientific projects as mind-bending as plotting the evolution of the cosmos, and as mundane as predicting traffic snarl-ups.} Thus, Option C is eliminated.

Option D: The author says that complex computations might "overwhelm" human faculties: {In most systems, tracking such changes over time quickly overwhelms human powers of calculation.} However, it would be extreme to state that it's "beyond human capability." Hence, D is incorrect.

17. **Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.**

1. One big reason is that the certainty of on-then-off is a lot easier for them to navigate than a thoughtful approach to transitions.

2. Bad drivers do this often, everywhere I've ever been in the world.

3. If you're going to have to stop soon, perhaps you should start coasting now.

4. Instead of gracefully and safely slowing for a light they know will be red by the time they get there, or even a stop sign, they hit the gas and then slam the brakes.

Sol. A brief reading of the sentences suggests that the paragraph is trying to relate the habit of stepping on the gas just before a red light comes to our general unease with thoughtful transitions. 24 is a mandatory introductory pair, which shares an observation that the author has made. Pair 13 is an attempt by the author to make sense of it all, by showing how it is an inherent tendency of ours to do so. Hence, the correct sequence is 2413.

18. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Ideological resistance to C-sections was clearly part of the story in Shrewsbury and Telford, where the trust prided itself on a startlingly low caesarean rate while seemingly sweeping the consequences under the carpet. Ockenden concluded this approach was harmful for some and welcomed new NHS England advice not to judge hospitals on their caesarean rates, reversing years of pressure for more "natural" births (which also just happen to be cheap). But the report is clear that isn't the whole story. Similarly, while it backed recent calls for a £350m annual increase in England's cash-starved maternity budget now, lack of money doesn't explain avoidable deaths in Shropshire dating back to the 2000s, relative boom years for NHS funding.

A. The NHS has issued strict guidelines regarding caesarian births, where a lack of budget should not be a dissuading factor for the same.

B. A recent NHS report revealed that ideological resistance and fear of being judged over high C-section numbers fuelled many hospitals to pressure mothers into having natural births even when C-sections were warranted.

C. An NHS report identified that while budgetary reasons might have caused an over-emphasis on natural births over C-sections, overall, ideological resistance was the major driving force.

D. A report on the detrimental impact of pressure for more natural births identified a plethora of causes, including ideological resistance and budgetary reasons, but concluded that there could be more factors involved.

Sol. The main points of the paragraph are:

1. A report revealed that various factors promoted natural birth over caesarian in certain hospitals, even if it was to the detriment of the patient.

2. The report, however, does not paint the complete picture.

Option D comes the closest to capturing the above points and is the correct answer.

A: Misses out on points 1 and 2.

B: Misses out on point 2.

C: Misses out on point 2.

19. **Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.**

1. Evolution defied our expectations, and we got Omicron, which has a huge number of mutations and isn't descended from Delta.

2. Six months ago many scientists, including us, thought the next variant would descend from Delta, which was dominant at the time.

3. The fact that the virus developed the ability to infect people who had been vaccinated or previously infected shouldn't have been a surprise, but how it happened with Omicron certainly was.

4. Evolution often proceeds stepwise, with new successful variants descending from recent successful ones.

Sol. A brief reading of the sentences suggests that the paragraph is about the anomaly of mutation in the omicron variant of coronavirus. 3 sets the context by introducing the topic here. 4 then tells us the norm, that newer variants generally descend from successful variants. 2 then mentions the expectations that were in line with this reasoning. 1 then states what actually happened, defying those expectations. Hence, the correct arrangement is 3421.

20. **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. It was recently reported that Nadine Dorries, the UK minister for culture wars, stormed into a meeting with Microsoft and demanded to know when they were going to get rid of "algorithms".

2. Even if the claims for such technologies are so far overblown, they all represent novel attempts to intrude into what used to be a private mental space.

3. Researchers in facial-recognition AI systems, for example, claim to be able to read political affiliation from a photograph; social-media companies analyse posts for indicators of personality traits; fitness trackers are attempting to move into mood-tracking.

4. It is not really possible for a software company, since all computer programs are made of algorithms, but the story does reflect an increasing public suspicion of the ways machines are being used to manipulate us.

5. From facecrime to Facebook, and Orwell's "prolefeed" ("the rubbishy entertainment and spurious news which the Party handed out to the masses") to the Twitter feed, is a worryingly short distance.

Sol. A brief reading of the sentences suggests that the paragraph is about the deleterious effects of technology on us. 1 sets the context by mentioning a recent event that took place in this regard. 4 then highlights why the event is so significant. 3 then mentions some other ways technology could exercise control on us. 2 then takes a moderate stance by saying that though the claims could be overblown, the novel ways mentioned represent new ways of intrusion.

5, though on the same line as the paragraph, focuses solely on manipulation by social media, and does not fit well with the other four sentences. Hence, the 5 is out of context here.

21. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

In recent years, artists, agrarian dreamers and entrepreneurs have started driving a return to Italy's neglected rural villages. New eco-tourism ventures draw visitors and new transplants to remote locales. Crowdfunded cooperatives help newcomers open grocery stores, art centres, co-working spaces, a pizzeria. In 61 towns across the country, local governments will even sell you a house for €1. This highly publicized initiative has its charms, but the results so far have been surprisingly modest given contemporary enthusiasm for this. The town of Gangi, in Sicily, is considered an exemplary success, yet only 13 such houses have sold since the program began in 2009, a rate of just one a year.

A. Artists from all walks of life and crowdfunded cooperatives are actively striving to revitalize the neglected rural villages of Italy.

B. The effort to revitalize the neglected rural villages of Italy has given average results despite the enthusiasm surrounding the same.

C. Repopulating the poor and neglected rural villages of Italy is proving to be difficult as only a few houses are being reclaimed by people.

D. Many deserted villages of Italy find themselves filled with artists. Despite this, a few are willing to buy homes and settle there for good.

Sol. The main points of the paragraph are:

1. An active effort is being made to repopulate the neglected rural areas in Italy.

2. The results of this effort have not been outstanding in spite of the enthusiasm surrounding this.

Option B comes the closest in capturing both the ideas and is the correct answer.

A: Misses out on point 2.

C: Misses out on point 1.

D: Misses out on point 1.

22. **Choose the most logical order of sentences from among the given choices to construct a coherent paragraph.**

1. Is it easy to understand, did you know what it's about before you pick up the book?

2. But general "how does this make you feel" feedback on a new concept is almost certain to give you exactly the wrong feedback.

3. The idea isn't going to work because it's objectively, obviously and completely better. It's going to work because the network effects and cultural dynamics behind it push it forward.

4. What would a focus group have said about the title of Harper Lee's To Kill a Mockingbird?

Sol. A brief reading of the sentences suggests that the paragraph is about how a focus group feedback cannot really tell us if something is going to work or not. The author makes this point by using the example of Harper Lee's book title. 4 sets up the example and 1 adds the details to how a focus group on Harper Lee's book title would have sounded like. 4-1 together give the

example to show how a focus group cannot really predict what will work. 2 makes the broader point that in general focus group questions cannot really garner valuable feedback. 3 explains why. Hence, the order should be 4123.

23. **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. But, after nearly two years of school closures and a dramatic drop in demand for the village's products, factory owners reduced their workforce by more than half.

2. A recent ministry of home affairs report said that the village would be developed as a "special zone" for manufacturing.

3. This village, with an abundance of trees, about 10 miles south of Srinagar city in Kashmir's Pulwama district, supplies more than 90% of the wood used by India's pencil manufacturers, which export to more than 150 countries.

4. Before Covid, more than 2,500 people worked in the village's 17 pencil factories and the industry supported about 250 families.

5. Pick up a pencil anywhere across India and it is likely to come from the poplar trees of Ukhoo.

Sol. A brief reading of the sentences suggests that the paragraph is about pencil production in the village of Ukhoo, which has been seriously affected by the pandemic. 5 is an apt opening sentence that introduces the significance of the village of Ukhoo. 3 then provides further details about the village. 41 is a mandatory pair that describes the impact of the pandemic on pencil production.

2 talks about making the village a 'special zone' which is not in line with the rest of the sentences. Hence, 2 here is out of context.

24. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Cavendish presents herself as literally in two minds. The two 'parts' of Cavendish's mind cannot come to an agreement (perhaps reflecting the fact that reasoning can sometimes lead to an impasse). She thus asks her readers to play the role of an impartial judge and 'if possible, to reduce them to a set[t]led peace and agreement.' Sometimes you need to speak to someone else before you can work out what you really think. Undoubtedly, part of Cavendish's aim here is to describe, albeit in an exaggerated fashion, her own reasoning processes.

A. Cavendish describes her reasoning process as containing 'two minds' that often end up in an impasse, and thus require impartial inputs from the readers to reconcile these two parts.

B. Cavendish passes the onus of deciphering her reasoning process onto her readers, who serve as impartial judges trying to find points of agreement between her 'two minds'.

C. Cavendish exaggerates how her reasoning works by tasking her readers to be impartial judges who critically evaluate the overall process intending to overcome innate impasses.

D. Cavendish emphasises the need to clarify one's own reasoning process to deal with logical impasses; she does so by tasking her readers to act as impartial judges trying to reconcile her 'two minds'.

Sol. The main points of the paragraph are:

1. Cavendish's works include her debating with herself as if one part of her mind disagrees with the other part.

2. This is done to represent her reasoning process.

3. Through this, she enables her reader to reason and come up with a different perspective.

Option A comes the closest to capturing the author's point and is the correct answer.

Option B: The statement here is distorted since Cavendish describes her reasoning process in a specific way and her readers are part of this process; claiming that unravelling the process is upto the readers is incorrect.

Option C: The summary here wholly misses out on the process itself - the use of 'two minds' and the role of the readers.

Option D: Pay heed to the phrase: "...the need to clarify one's own reasoning process to deal with logical impasses..." - no such suggestion is made.

Hence, Option A is the correct choice.

Instructions

Dr Xavier works as a scientist at a top-secret military facility. Considering the top-secret nature of the work, the entry to his lab is protected by a two-factor authentication system. The person must scan their retina and enter an n-character password to enter the lab. All the characters in the password are unique.

There are specific rules to using the authentication system. The retinal scan can be done at the beginning or at the end of entering the passcode. For example, if "R" represents the retinal scan and "ABCDEF" is the passcode (n = 6), then the valid orders are "RABCDEF" and "ABCDEFR".

Since most of the people working in the facility are pretty old, they tend to forget the order of the characters in the password and get locked out. The authorities are considering some relaxation in the password order to reduce this inconvenience.

Based on this information, answer the following questions.

25. The lab has allowed the variations of the required password sequence such that the sequence of the characters can vary from the original sequence by one place for any of the characters. For example, if the actual sequence of characters was "ABCDEF", then "BADCEF" is allowed, but "EBCDAF" is not. The rules regarding the retinal scan stay the same. For n = 6, how many different ways of entering a valid passkey are possible?

A. 26

B. 12

C. 24

D. 11

Sol. Let R denote the retinal scan and ABCDEF be the original password. Since R can be at the beginning or end of the password, there are two ways of entering the complete password.

We are given that any character can vary its position by one place.

Case 1: Only one pair of characters swap their positions.

The possible sequences of passwords are BACDEF, ACBDEF, ABDCEF, ABCEDF, and ABCDFE.

Case 2: Two pairs of characters swap their positions.

When A-B are swapped, the other pair to be swapped can be C-D, D-E or E-F. Thus, possible sequences are BADCEF, BACEDF and BACDFE.

When B-C are swapped, the other pair to be swapped can be D-E or E-F. Thus, possible sequences are ACBEDF and ACBDFE.

When C-D are swapped, the other pair to be swapped can be E-F. Thus, the possible sequence is ABDCFE.

Case 3: Three pairs of characters swap their positions.

The possible sequence of password is BADCFE.

Thus, the total number of possible valid sequences of password = original + 1-pair + 2-pair + 3-pair = 1 + 5 + 6 + 1 = 13

Including the retinal scans, the number of possible ways of entering a password = 2 x 13 = 26.

Hence, option A is the correct answer.

26. The lab has also allowed variations of the sequence of the original password such that, at most, two characters are out of place. For example, if "ABCDEFG" is the original sequence, "GBCDEFA" is allowed, but "GBDCEFA" is not. The rules regarding the retinal scan stay the same. For n = 7, how many different ways of entering a valid passkey are possible?

Sol. Let the retinal scan be denoted by R and the password by ABCDEFG.

Since the retinal scan can be at the beginning or end of the password, there are two ways of entering the passkey.

At most, two characters can be out of place from the original sequence. Thus, we can swap A with B or C or D or E or F or G. Similarly; we can swap B with A or C or D or E or F or G and so on.

Thus, all the possible valid sequences of the password are BACDEFG, CBADEFG, DBCAEFG, EBCDAFG, FBCDEAG, GBCDEFA, ACBDEFG, ADCBEFG, AECDBFG, AFCDEBG, AGCDEFB, ABDCEFG, ABEDCFG, ABFDECG, ABGDEFC, ABCEDFG, ABCFEDG, ABCGEFD, ABCDFED, ABCDGFE and ABCDEGF.

Thus, a total of 22 different sequences of the password [including the original] are possible

Thus, the total number of ways of entering a valid password = 22 x 2 = 44

Alternative solution:

2 characters can be selected from 7 characters in 7C2 ways i.e. 21 ways and since R can be put in the starting and the end,

Total ways = (21 + 1) x 2 = 44

27. The lab has also allowed variations of the sequence of the original password such that characters always swap their places pairwise and at most, two swaps are possible. For example, if "ABCDEFG" is the original sequence, "GBCDEFA" and "GBDCEFA" is allowed, but "GCBDFEA" is not. Also, the swaps are done simultaneously. So, for the earlier sequence, "BCADEFG" is not allowed. The rules regarding the retinal scan stay the same. For n = 4, what is the ratio of the number of ways of entering the passkey when at most one pair swaps to when exactly two pairs swap their places?

A. 7:6

B. 1:1

C. 7:3

D. 6:7

Sol. Let the retinal scan be denoted by R and the original sequence of the password be "ABCD".

Since the retinal scan can be at the beginning or end of the password, there are two ways of entering the passkey.

At most, two characters can be out of place from the original sequence.

Case 1: Only one pair is out of place.

All the possible swaps can be A-B, A-C, A-D, B-C, B-D and C-D.

Thus, there are six such sequences where one pair of characters is out of place.

Case 2: Two pairs of characters are out of place.

First swap A-B: The second swap will be C-D. Thus, the sequence becomes BADC.

First swap A-C: The second swap will be B-D. Thus, the sequence becomes CDAB.

First swap A-D: The second swap will be B-C. Thus, the sequence becomes DCBA.

First swap B-C: The second swap will be A-D. Thus, the sequence becomes DCBA.

First swap B-D: The second swap will be A-C. Thus, the sequence becomes CDAB.

First swap C-D: The second swap will be A-B. Thus, the sequence becomes BADC.

Thus, all the unique sequences are BADC, CDAB and DCBA.

Total number of ways of entering passkey with at most one pair of characters out of place = (1+6) x 2 = 14

Total number of ways of entering the passkey with precisely two pairs of characters out of place = 3 x 2 = 6

Thus, the required ratio = 14:6 = 7:3

Hence, option C is the answer.

28. Additional information: To further increase the security, the lab has decided to add the fingerprint scan along with the password and the retinal scan. Similar to the retinal scan, the fingerprint can be scanned at the beginning or end of the password in any order. For example, if "ABCD" is the password and "F" and "R" represent the fingerprint and retinal scans, then valid inputs of the passkeys are "FRABCD" or "FABCDR" or "RFABCD" and so on.

If the lab has allowed variations of the password sequence such that the characters can be entered in any order, what is the total number of possible ways of entering a valid passkey for n = 5?

A. 720

B. 120

C. 480

D. 960

Sol. Let F, R and P represent the fingerprint, retinal scan and password, respectively. Thus, the different possible ways of entering the passkey are FRP, RFP, PFR, PRF, FPR and RPF. Therefore, a total of 6 different ways.

Since the password characters can be entered in any order, the total number of possible password sequences for n = 5 is = 5!

Thus, the number of ways of entering a valid passkey = 6 x 5! = 6 x 120 = 720

Hence, option A is the correct answer.

29. Additional information: To further increase the security, the lab has decided to add the fingerprint scan along with the password and the retinal scan. Similar to the retinal scan, the fingerprint can be scanned at the beginning or end of the password in any order. For example, if "ABCD" is the password and "F" and "R" represent the fingerprint and retinal scans, then valid inputs of the passkeys are "FRABCD" or "FABCDR" and so on.

If the lab has allowed variations of the original password sequence such that at most three characters can be out of place, how many different ways of entering the passkey are possible for n = 5?

A. 180

B. 78

C. 186

D. 234

Sol. Let F, R and P represent the fingerprint, retinal scan and password, respectively. Thus, the different possible ways of entering the passkey are FRP, RFP, PFR, PRF, FPR and RPF. Therefore, a total of 6 different ways.

At most, three characters can be out of place in the password.

Let the original sequence of the password be "ABCDE".

Case 1: Only one character is out of place.

This is not possible as we require at least two characters to be out of place.

Case 2: Two characters are out of place.

Two characters can be selected as ${}^5C_2 = 10$. Two characters can be out of place in only 1 way.

For example, let A and B be selected. The only possible way is BACDE.

Thus, the total number of arrangements = $10 \times 1 = 10$

Case 3: Three characters are out of place.

Three characters can be selected in ${}^5C_3 = 10$. Three characters can be out of place in 2 ways.

For example, let A, B, and C are selected. Thus, the possible arrangements are CABDE and BCADE.

Thus, the total arrangements in this case = $10 \times 2 = 20$

Thus, the total number of ways of entering a passkey = $(1 + 10 + 20) \times 6 = 186$

Hence, the answer is option C.

30. Additional information: To further increase the security, the lab has decided to add the fingerprint scan along with the password and the retinal scan. Similar to the retinal scan, the fingerprint can be scanned at the beginning or end of the password in any order. For example, if "ABCD" is the password and "F" and "R" represent the fingerprint and retinal scans, then valid inputs of the passkeys are "FRABCD" or "FABCDR" and so on.

The lab allows variations in the sequence of the original password such that the sequence of the characters can vary from the original sequence by exactly two places for any of the characters. For example, if "ABCDEF" is the original sequence, "CDABEF" is allowed, but "CFADEB" is not. For n = 6, how many possible ways can the passkey be entered?

A. 13

B. 78

C. 72

D. 54

Sol. Let the fingerprint, retinal scan, and password be denoted by F, R, and P. Thus, the different possible ways of entering the passkey are FRP, RFP, PFR, PRF, FPR and RPF. Therefore, a total of 6 different ways.

Let the original sequence of the password be "ABCDEF".

The characters can vary from the original sequence in two places for any characters.

Case 1: Only one pair of characters vary positions.

The possible swaps can be A-C, B-D, C-E and D-F.

Thus, the possible password sequences are CBADEF, ADCBEF, ABEDCF and ABCFED.

Case 2: Two pairs of characters vary in positions.

The first of the two pairs can be A-C, B-D, C-E and D-F.

A-C: The second pair can be B-D or D-F. Thus, possible sequences are CDABEF and CBAFED.

B-D: The second pair can be A-C or C-E. Thus, possible sequences are CDABEF and ADEBCF.

C-E: The second pair can be B-D or D-F. Thus, possible sequences are ADEBCF and ABEFCD.

D-F: The second pair can be C-E or A-C. Thus, possible sequences are ABEFCD and CBAFED.

Thus, all the unique password sequences are CDABEF, ADEBCF, ABEFCD and CBAFED.

Case 3: Three pairs of characters vary in positions.

This is not possible in case of a 6-character password.

Thus, the total possible sequences of the password = original + 1 pair + 2 pair = 1 + 4 + 4 = 9

Thus, the total ways of entering the passkey = 6 x 9 = 54.

Instructions

There are eight members in a photography team and have attended a meeting to discuss and distribute the work regarding their future project. They are seated on the sides of a rectangular table facing each other. Four of them are facing north, and the remaining are facing south. Eight of them are experts in eight different photographs: Food, Nature, Wedding, Fine art, Fashion, Travel, Architectural and Street. Each of them has to submit a portfolio from their expert area of photography. All of them are from eight different places: Eluru, Kamle, Hojai, Kutch, Mysore, Kollam, Sidhi and Erode. There are three females (Latha, Mangli, Navya) and five males (Arav, Bunny, Chandu, Dravid, Eshwar) in the team.

1. No two females are sitting adjacent to each other or facing each other. No female is an expert in fashion photography. Eshwar is not an expert in wedding photography.

2. Dravid is from Kamle, an expert in food photography who sits adjacent to a female and not at the corners.

3. Employees experts in wedding and street photography are facing each other.

4. Only one female Latha is facing south, and a person from Hojai is sitting to the immediate right of Latha.

5. Navya is from Kollam and an expert in street photography.

6. Person from Hojai is not facing the street photographer.

7. Bunny is an expert in architectural photography. Chandu is an expert in travel photography and sits at the corner.

8. Person who is an expert in fine arts photography is sitting to the right of Dravid.

9. Person from Kutch who is adjacent to a female and not sitting at the corners is facing the person who is an expert in fashion photography.

31. If Chandu is from Sidhi, how many ways we can complete the arrangement of positions and places?

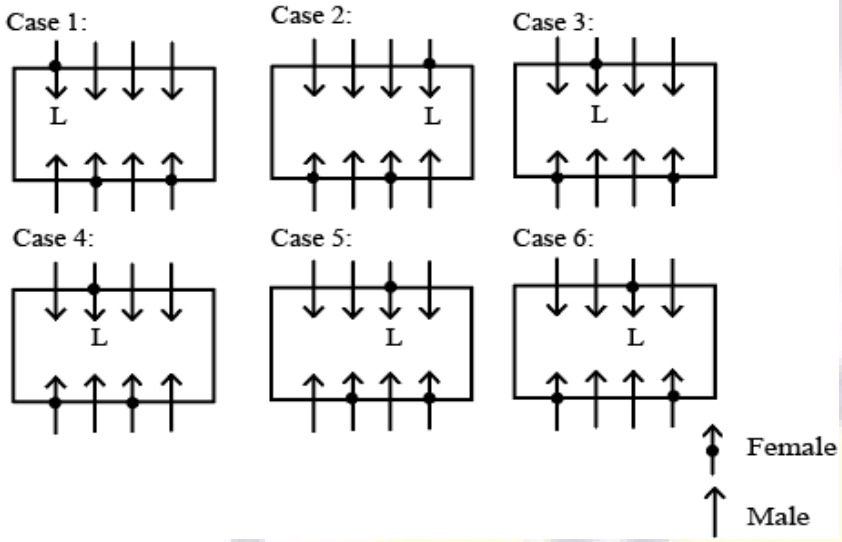
A. 2

B. 4

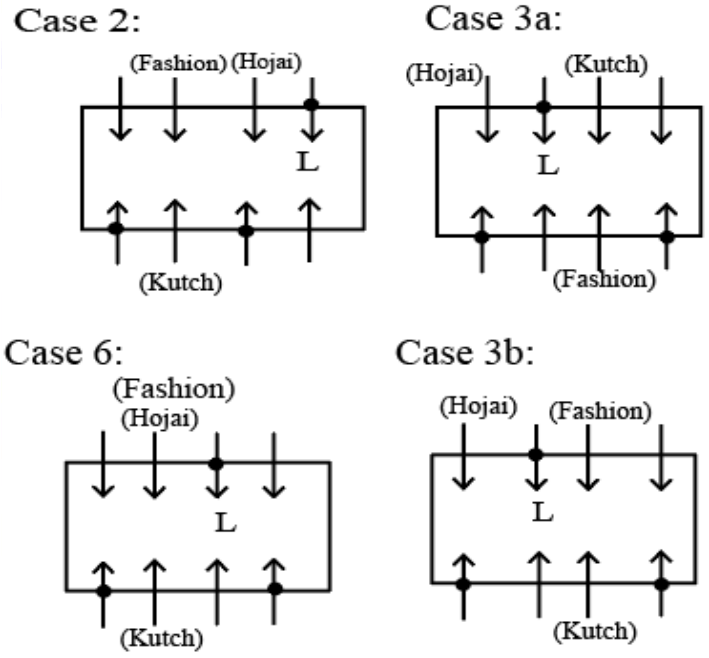
C. 6

D. 8

Sol. It is mentioned in statements 1 and 4 that no two females are sitting adjacent to each other, and only one female is facing south. There are 6 cases possible for given conditions.

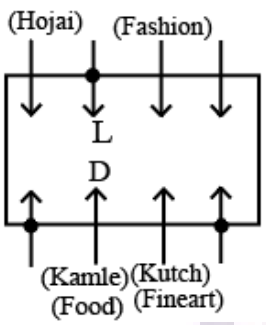


It is mentioned in statement 1 that a person from Hojai is sitting to the immediate right of Latha. Therefore, case 1 is not possible. In statement 9, it is mentioned that a person from Kutch is adjacent to a female, not sitting at corners and facing a fashion photographer expert. It is said that no female is an expert in fashion photography. Therefore, the person from Kutch should not face any female photographer. Therefore, case 4 and case 5 are not possible.

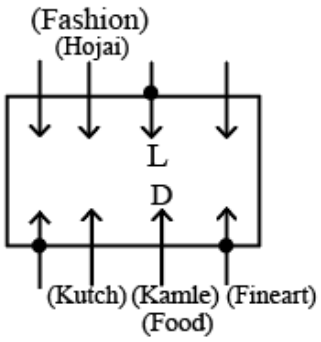


In statement 2, it is mentioned that Dravid sits adjacent to a female and not at the corners. Therefore, case 2 is not possible. In statement 8, it is said that a person who is an expert in fine art photography is sitting to the right of Dravid; this implies case 3(a) is not possible as it violates statement 6. In case 3(b), a person who is an expert in fine art photography can sit to the immediate right of Dravid or two places to the right of Dravid. If the person who is an expert in fine art photography sits two places to the right of Dravid, then Navya has to sit opposite to the person from Hojai. This violates statement 6. Therefore, the only possibility is the person who is an expert in fine art photography sits to the immediate right of Dravid.

Case 3b:

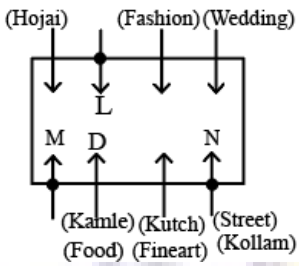


Case 6:

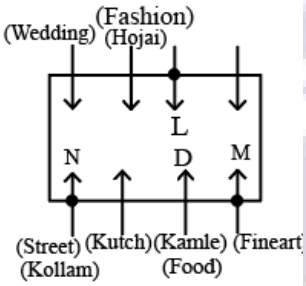


From statement 3, employees experts in wedding and street photography face each other, and Navya is an expert in street photography. Therefore, the person from Hojai doesn't face Navya.

Case 3b:

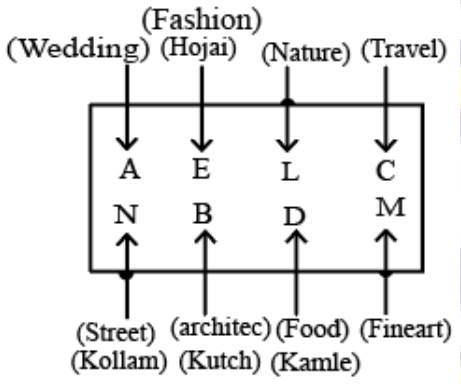


Case 6:



It is mentioned in statement 7 that Bunny is an expert in architectural photography. Chandu is an expert in travel photography and sits at the corner. Case 3(b) fails to satisfy the above condition. Therefore, case 6 is the only possible arrangement. It is also mentioned that E is not an expert in wedding photography; therefore, E is an expert in fashion photography.

Final arrangement:



If Chandu is from Sidhi, we can arrange places in 3! ways i.e. 6 ways

Answer is option C.

32. The person who is an expert in Fashion photography is from which place?

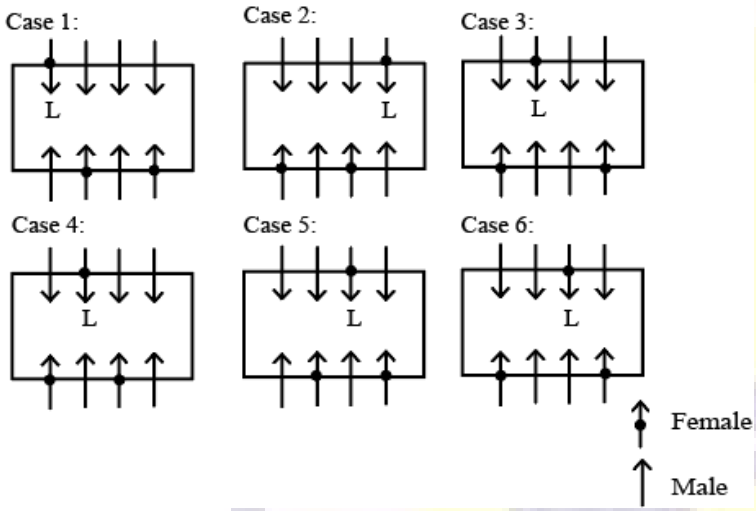
A. Kutch

B. Mysore

C. Eluru

D. Hojai

Sol. It is mentioned in statements 1 and 4 that no two females are sitting adjacent to each other, and only one female is facing south. There are 6 cases possible for given conditions.



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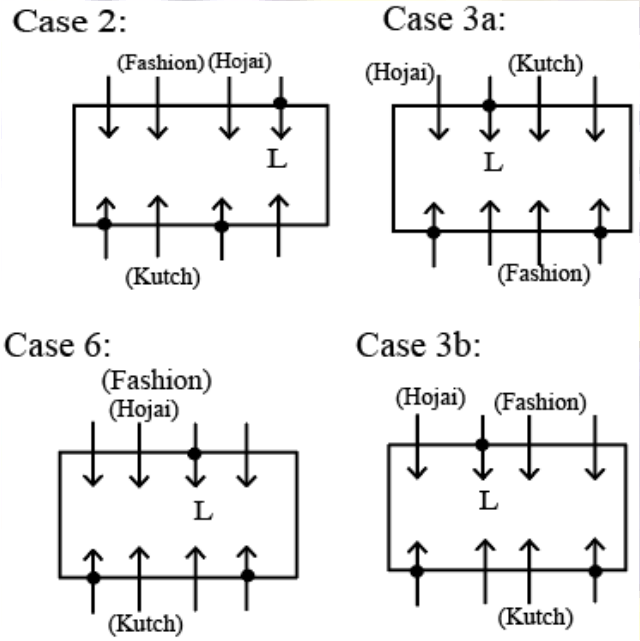
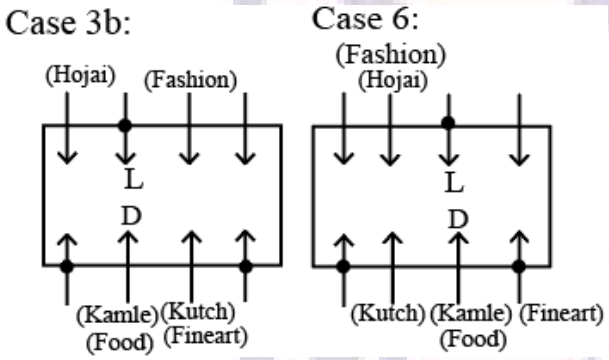


In statement 2, it is mentioned that Dravid sits adjacent to a female and not at the corners. Therefore, case 2 is not possible. In statement 8, it is said that a person who is an expert in fine art photography is sitting to the right of Dravid; this implies case 3(a) is not possible as it violates statement 6. In case 3(b), a person who is an expert in fine art photography can sit to the immediate right of Dravid or two places to the right of Dravid. If the person who is an expert in fine art photography sits two places to the right of Dravid, then Navya has to sit opposite to the person from Hojai. This violates statement 6. Therefore, the only possibility is the person who is an expert in fine art photography sits to the immediate right of Dravid.



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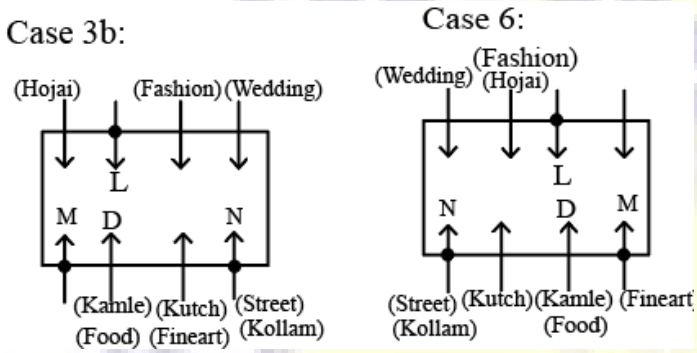

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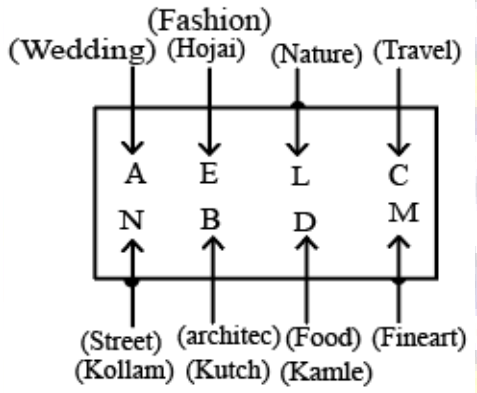
Final arrangement:



Person who is expert in Fashion photography is from Hojai.

Answer is option D.

33. Eshwar is an expert in which photography?

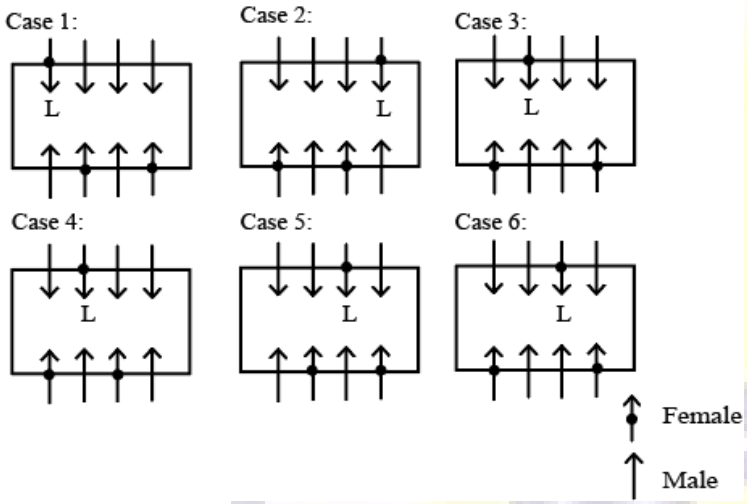
A. Fashion

B. Nature

C. Fine art

D. None of the above

Sol. It is mentioned in statements 1 and 4 that no two females are sitting adjacent to each other, and only one female is facing south. There are 6 cases possible for given conditions.



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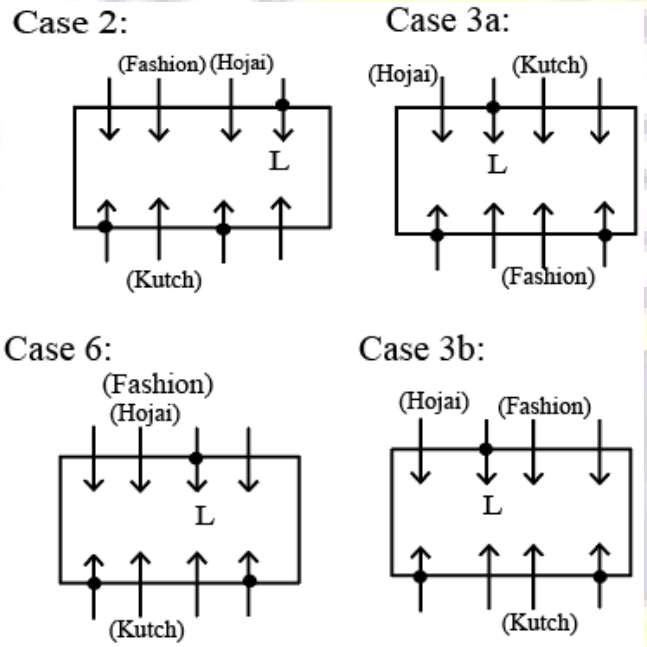

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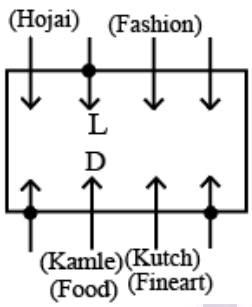
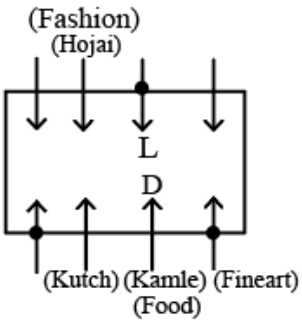
Case 3b:

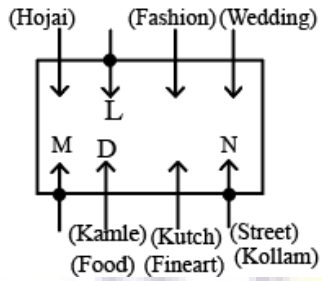


Case 6:

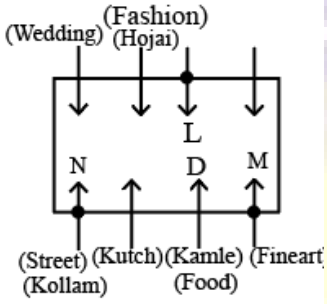


From statement 3, employees experts in wedding and street photography face each other, and Navya is an expert in street photography. Therefore, the person from Hojai doesn't face Navya.

Case 3b:



Case 6:



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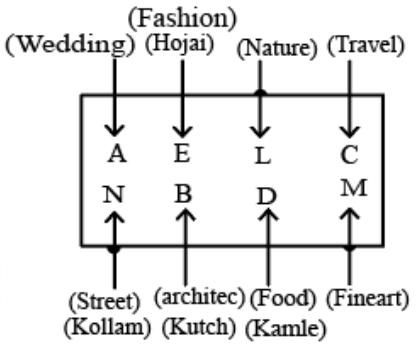
Final arrangement:



Eshwar is an expert in Fashion photography.

Answer is option A.

34. Bunny is related to Dravid in the same way Latha is related to whom?

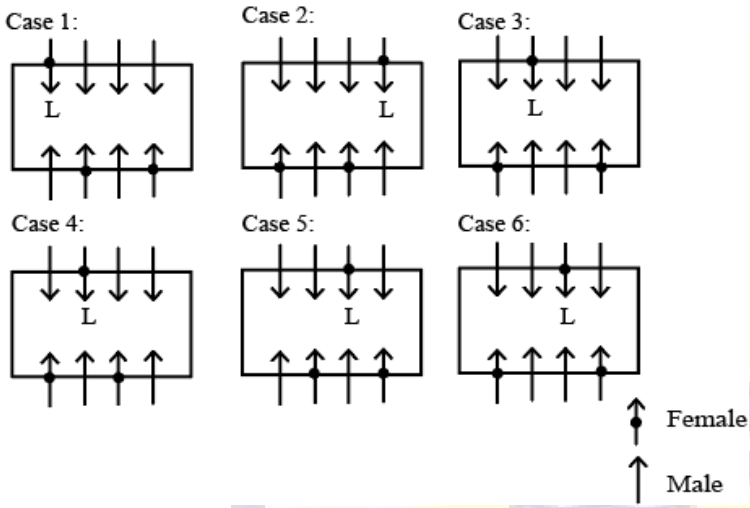
A. Chandu

B. Eshwar

C. Arav

D. Navya

Sol. It is mentioned in statements 1 and 4 that no two females are sitting adjacent to each other, and only one female is facing south. There are 6 cases possible for given conditions.



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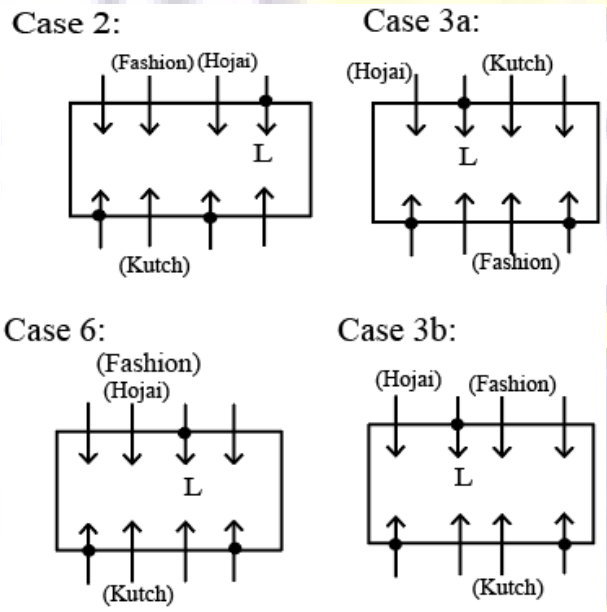

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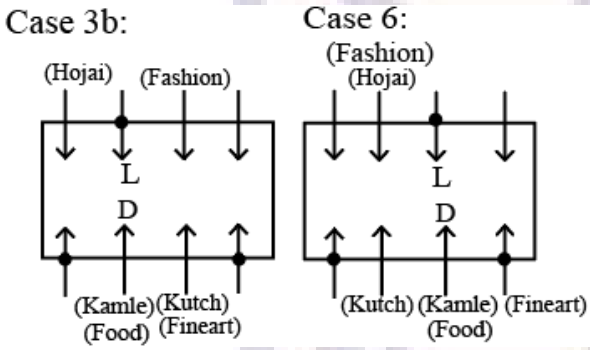

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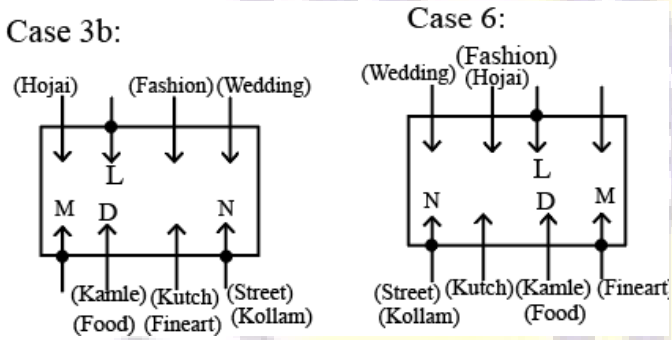

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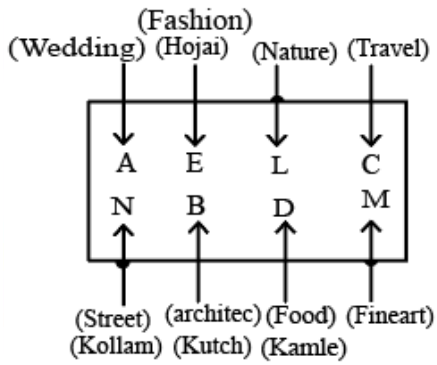
Final arrangement:



Bunny is seated on the immediate left of Dravid. Latha is seated on the immediate left of Eshwar.

Answer is option B.

Instructions

Twelve teams, Austria, Brazil, Congo, Denmark, England, France, Germany, Hungary, India, Jakarta, Kuwait and Lebanon, participated in the Hockey World Cup 2022. The tournament consisted of two rounds.

In round 1, the teams are divided into four groups of three teams each. Each team plays against every other team only once. Each win fetches 3 points, draw 1 point and loss 0 points. The team with the highest number of points in each group move to the second round. If two teams score the same number of points in a group, then the team with the maximum value of "Goals For" moves forward. The score table after the first round for the four groups is as given below:

Groups	Teams	Goals For	Goals Against	Points
Group 1	Austria	4	1	6
	Brazil	2	3	1
	Congo	1	3	1
Group 2	Denmark	5	3	6
	England	3	2	3
	France	2	5	0
Group 3	Germany	1	1	2
	Hungary	2	2	2
	India	3	3	2
Group 4	Jakarta	1	1	2
	Kuwait	5	3	4
	Lebanon	2	4	1

Further information about round 1:

1. The match between England and France result in England winning 2-0.

2. Austria scored the same number of goals in both its games.

In round 2, each team plays once against every other team. The points earned for win, loss and draw are the same as round 1. The team scoring the maximum number of points in round 2 is declared the winner.

For round 2, the following information is known:

1. The team that scored the lowest in round 1, among the teams moving forward, won two out of the three matches in round 2.

2. The two teams scoring the highest points in round 1 scored the lowest possible points in round 2. None of the teams lost all their matches in round 2.

3. Three of the matches resulted in a draw. All of the teams scored different numbers of points in round 2.

4. The scoreline for the match between Kuwait and India was 1-1.

5. Austria's total number of points scored in the tournament is higher than Denmark's.

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

35. In round 1, find the ratio of the number of matches where the difference between the goals scored is 2, 1 and 0, respectively?

A. 2:1:1

B. 1:1:2

C. 1:2:1

D. 1:2:3

Sol. Let the countries Austria, Brazil, Congo, Denmark, England, France, Germany, Hungary, India, Jakarta, Kuwait and Lebanon be denoted by A, B, C, D, E, F, G, H, I, J, K and L, respectively.

Round 1:

Each team plays once with every other team in its group. Thus, each group had three matches.

Group 1: A could have only scored 6 points by winning both its matches, and Brazil and Congo can only achieve one by losing one game and drawing the other.

Since we know that A scored the same number of goals in both its matches, thus, it scored two goals in each match. B and C's match against each other was a draw. Therefore, the scorelines of the matches in group 1 can only be:

Match	Scoreline
A – B	2 – 1
A – C	2 – 0
B – C	1 – 1

Thus, the team moving to round 2 will be A.

Group 2: We are given that the scoreline of match E - F is 2 - 0. Thus, using the "Goals for" and "Goals against" data, the scorelines of the remaining two matches can be found as follows:

Match	Scoreline
D – E	2 – 1
D – F	3 – 2
E – F	2 – 0

Thus, the team moving to round 2 will be D.

Group 3: Here, all the matches resulted in a draw. Since the goals for and against team G are 1 and 1, respectively, the scorelines of its matches can only be (1 - 1) and (0 - 0); for H, it can only be (0 - 0) and (2 - 2) and for I, (1 - 1) and (2 - 2).

Match	Scoreline
G – H	0 – 0
G – I	1 – 1
H – I	2 – 2

Here, all the three teams got the same number of points; thus, the team with a maximum value of Goals For will move to the next round.

Hence, the team moving to round 2 will be I.

Group 4: J's both matches resulted in a draw, K's resulted in a win, and a draw and L's resulted in a loss and a draw. J's scorelines can only be (1 - 1) and (0 - 0), L's can only be (0 - 0) and (2 - 4), and K's can only be (4 - 2) and (1 - 1).

Match	Scoreline
J – K	1 – 1
J – L	0 – 0
K – L	4 – 2

Thus, the team moving to round 2 will be K.

Matches with goal difference 2: A - C, E - F and K - L. Thus, a total of three games.

Matches with goal difference 1: A - B, D - E and D - F. Thus, three games.

Matches with goal difference 0: B - C, G - H, G - I, H - I, J - K, and J - L. Thus, six games.

Hence, the required ratio is = 3:3:6 = 1:1:2.

36. Combining the scores from rounds 1 and 2, which team scored the maximum number of points?

A. India

B. Austria

C. Kuwait

D. Both India and Kuwait

Sol. Let the countries Austria, Brazil, Congo, Denmark, England, France, Germany, Hungary, India, Jakarta, Kuwait and Lebanon be denoted by A, B, C, D, E, F, G, H, I, J, K and L, respectively.

Round 1:

Each team plays once with every other team in its group. Thus, each group had three matches.

Group 1: A could have only scored 6 points by winning both its matches, and Brazil and Congo can only achieve one by losing one game and drawing the other.

Since we know that A scored the same number of goals in both its matches, thus, it scored two goals in each match. B and C's match against each other was a draw. Therefore, the scorelines of the matches in group 1 can only be:

Match	Scoreline
A – B	2 – 1
A – C	2 – 0
B – C	1 – 1

Thus, the team moving to round 2 will be A.

Group 2: We are given that the scoreline of match E - F is 2 - 0. Thus, using the "Goals for" and "Goals against" data, the scorelines of the remaining two matches can be found as follows:

Match	Scoreline
D – E	2 – 1
D – F	3 – 2
E – F	2 – 0

Thus, the team moving to round 2 will be D.

Group 3: Here, all the matches resulted in a draw. Since the goals for and against team G are 1 and 1, respectively, the scorelines of its matches can only be (1 - 1) and (0 - 0); for H, it can only be (0 - 0) and (2 - 2) and for I, (1 - 1) and (2 - 2).

Match	Scoreline
G – H	0 – 0
G – I	1 – 1
H – I	2 – 2

Here, all the three teams got the same number of points; thus, the team with a maximum value of Goals For will move to the next round.

Hence, the team moving to round 2 will be I.

Group 4: J's both matches resulted in a draw, K's resulted in a win, and a draw and L's resulted in a loss and a draw. J's scorelines can only be (1 - 1) and (0 - 0), L's can only be (0 - 0) and (2 - 4), and K's can only be (4 - 2) and (1 - 1).

Match	Scoreline
J – K	1 – 1
J – L	0 – 0
K – L	4 – 2

Thus, the team moving to round 2 will be K.

Round 2:

Each team played once with every other team. Thus, the total number of matches in round 2 is 6.

We are given that the team that scored the lowest won 2 of its matches. Thus, team "I" won 2 of its matches.

From point 2, the two teams scoring maximum in round 1 scored the lowest possible points in round 2, and none of the teams lost all their matches. Thus, the score cannot be 0.

From point 3, all the teams scored different numbers of points in round 2. Thus, the lowest possible points are 1 and 2. Since A's total score is higher than D's (from point 5), A scored 2 points, and D scored 1 point in round 2. Thus, A had one loss and two draws, while D had two losses and one draw.

From point 4, the match between I and K was a draw. From all these points, we can deduce the results of games as follows.

I - K: Draw, I - A: I won, I - D: I won, K - A: Draw, K - D: K won and A - D: Draw.

Thus, the points table for round 2 becomes

Matches	Wins	Loss	Draw	Points
A	0	1	2	2
D	0	2	1	1
I	2	0	1	7
K	1	0	2	5

The new score table for A, I and K becomes

Team	Round 1 points	Round 2 points	Total points
A	6	2	8
I	2	7	9
K	4	5	9

Thus, both I and K scored the maximum number of points. Hence, option D is the answer.

37. What was the result of the match between Austria and Denmark?

A. Draw

B. Denmark won

C. Austria won

D. Cannot be determined

Sol. Let the countries Austria, Brazil, Congo, Denmark, England, France, Germany, Hungary, India, Jakarta, Kuwait and Lebanon be denoted by A, B, C, D, E, F, G, H, I, J, K and L, respectively.

Round 1:

Each team plays once with every other team in its group. Thus, each group had three matches.

Group 1: A could have only scored 6 points by winning both its matches, and Brazil and Congo can only achieve one by losing one game and drawing the other.

Since we know that A scored the same number of goals in both its matches, thus, it scored two goals in each match. B and C's match against each other was a draw. Therefore, the scorelines of the matches in group 1 can only be:

Match	Scoreline
A – B	2 – 1
A – C	2 – 0
B – C	1 – 1

Thus, the team moving to round 2 will be A.

Group 2: We are given that the scoreline of match E - F is 2 - 0. Thus, using the "Goals for" and "Goals against" data, the scorelines of the remaining two matches can be found as follows:

Match	Scoreline
D – E	2 – 1
D – F	3 – 2
E – F	2 – 0

Thus, the team moving to round 2 will be D.

Group 3: Here, all the matches resulted in a draw. Since the goals for and against team G are 1 and 1, respectively, the scorelines of its matches can only be (1 - 1) and (0 - 0); for H, it can only be (0 - 0) and (2 - 2) and for I, (1 - 1) and (2 - 2).

Match	Scoreline
G – H	0 – 0
G – I	1 – 1
H – I	2 – 2

Here, all the three teams got the same number of points; thus, the team with a maximum value of Goals For will move to the next round.

Hence, the team moving to round 2 will be I.

Group 4: J's both matches resulted in a draw, K's resulted in a win, and a draw and L's resulted in a loss and a draw. J's scorelines can only be (1 - 1) and (0 - 0), L's can only be (0 - 0) and (2 - 4), and K's can only be (4 - 2) and (1 - 1).

Match	Scoreline
J – K	1 – 1
J – L	0 – 0
K – L	4 – 2

Thus, the team moving to round 2 will be K.

Round 2:

Each team played once with every other team. Thus, the total number of matches in round 2 is 6.

We are given that the team that scored the lowest won 2 of its matches. Thus, team "I" won 2 of its matches.

From point 2, the two teams scoring maximum in round 1 scored the lowest possible points in round 2, and none of the teams lost all their matches. Thus, the score cannot be 0.

From point 3, all the teams scored different numbers of points in round 2. Thus, the lowest possible points are 1 and 2. Since A's total score is higher than D's (from point 5), A scored 2 points, and D scored 1 point in round 2. Thus, A had one loss and two draws, while D had two losses and one draw.

From point 4, the match between I and K was a draw. From all these points, we can deduce the results of games as follows.

I - K: Draw, I - A: I won, I - D: I won, K - A: Draw, K - D: K won and A - D: Draw.

Thus, the points table for round 2 becomes

Matches	Wins	Loss	Draw	Points
A	0	1	2	2
D	0	2	1	1
I	2	0	1	7
K	1	0	2	5

Thus, the match between A and D was a draw. Hence, option A is the answer.

38. What is the total number of matches won by the team winning the whole tournament?

Sol. Let the countries Austria, Brazil, Congo, Denmark, England, France, Germany, Hungary, India, Jakarta, Kuwait and Lebanon be denoted by A, B, C, D, E, F, G, H, I, J, K and L, respectively.

Round 1:

Each team plays once with every other team in its group. Thus, each group had three matches.

Group 1: A could have only scored 6 points by winning both its matches, and Brazil and Congo can only achieve one by losing one game and drawing the other.

Since we know that A scored the same number of goals in both its matches, thus, it scored two goals in each match. B and C's match against each other was a draw. Therefore, the scorelines of the matches in group 1 can only be:

Match	Scoreline
A – B	2 – 1
A – C	2 – 0
B – C	1 – 1

Thus, the team moving to round 2 will be A.

Group 2: We are given that the scoreline of match E - F is 2 - 0. Thus, using the "Goals for" and "Goals against" data, the scorelines of the remaining two matches can be found as follows:

Match	Scoreline
D – E	2 – 1
D – F	3 – 2
E – F	2 – 0

Thus, the team moving to round 2 will be D.

Group 3: Here, all the matches resulted in a draw. Since the goals for and against team G are 1 and 1, respectively, the scorelines of its matches can only be (1 - 1) and (0 - 0); for H, it can only be (0 - 0) and (2 - 2) and for I, (1 - 1) and (2 - 2).

Match	Scoreline
G – H	0 – 0
G – I	1 – 1
H – I	2 – 2

Here, all the three teams got the same number of points; thus, the team with a maximum value of Goals For will move to the next round.

Hence, the team moving to round 2 will be I.

Group 4: J's both matches resulted in a draw, K's resulted in a win, and a draw and L's resulted in a loss and a draw. J's scorelines can only be (1 - 1) and (0 - 0), L's can only be (0 - 0) and (2 - 4), and K's can only be (4 - 2) and (1 - 1).

Match	Scoreline
J – K	1 – 1
J – L	0 – 0
K – L	4 – 2

Thus, the team moving to round 2 will be K.

Round 2:

Each team played once with every other team. Thus, the total number of matches in round 2 is 6.

We are given that the team that scored the lowest won 2 of its matches. Thus, team "I" won 2 of its matches.

From point 2, the two teams scoring maximum in round 1 scored the lowest possible points in round 2, and none of the teams lost all their matches. Thus, the score cannot be 0.

From point 3, all the teams scored different numbers of points in round 2. Thus, the lowest possible points are 1 and 2. Since A's total score is higher than D's (from point 5), A scored 2 points, and D scored 1 point in round 2. Thus, A had one loss and two draws, while D had two losses and one draw.

From point 4, the match between I and K was a draw. From all these points, we can deduce the results of games as follows.

I - K: Draw, I - A: I won, I - D: I won, K - A: Draw, K - D: K won and A - D: Draw.

Thus, the points table for round 2 becomes

Matches	Wins	Loss	Draw	Points
A	0	1	2	2
D	0	2	1	1
I	2	0	1	7
K	1	0	2	5

The team winning the tournament is India. The total number of matches won by India is 2.

Hence, 2 is the required answer.

39. The teams are ranked based on the total points earned in the whole tournament, such that the teams scoring the same number of points get the same rank. The next team then gets ranked n+1 if n teams are ahead of it.

What is the difference between the points scored by the team ranked three and the team ranked sixth?

Sol. Let the countries Austria, Brazil, Congo, Denmark, England, France, Germany, Hungary, India, Jakarta, Kuwait and Lebanon be denoted by A, B, C, D, E, F, G, H, I, J, K and L, respectively.

Round 1:

Each team plays once with every other team in its group. Thus, each group had three matches.

Group 1: A could have only scored 6 points by winning both its matches, and Brazil and Congo can only achieve one by losing one game and drawing the other.

Since we know that A scored the same number of goals in both its matches, thus, it scored two goals in each match. B and C's match against each other was a draw. Therefore, the scorelines of the matches in group 1 can only be:

Match	Scoreline
A – B	2 – 1
A – C	2 – 0
B – C	1 – 1

Thus, the team moving to round 2 will be A.

Group 2: We are given that the scoreline of match E - F is 2 - 0. Thus, using the "Goals for" and "Goals against" data, the scorelines of the remaining two matches can be found as follows:

Match	Scoreline
D – E	2 – 1
D – F	3 – 2
E – F	2 – 0

Thus, the team moving to round 2 will be D.

Group 3: Here, all the matches resulted in a draw. Since the goals for and against team G are 1 and 1, respectively, the scorelines of its matches can only be (1 - 1) and (0 - 0); for H, it can only be (0 - 0) and (2 - 2) and for I, (1 - 1) and (2 - 2).

Match	Scoreline
G – H	0 – 0
G – I	1 – 1
H – I	2 – 2

Here, all the three teams got the same number of points; thus, the team with a maximum value of Goals For will move to the next round.

Hence, the team moving to round 2 will be I.

Group 4: J's both matches resulted in a draw, K's resulted in a win, and a draw and L's resulted in a loss and a draw. J's scorelines can only be (1 - 1) and (0 - 0), L's can only be (0 - 0) and (2 - 4), and K's can only be (4 - 2) and (1 - 1).

Match	Scoreline
J – K	1 – 1
J – L	0 – 0
K – L	4 – 2

Thus, the team moving to round 2 will be K.

Round 2:

Each team played once with every other team. Thus, the total number of matches in round 2 is 6.

We are given that the team that scored the lowest won 2 of its matches. Thus, team "I" won 2 of its matches.

From point 2, the two teams scoring maximum in round 1 scored the lowest possible points in round 2, and none of the teams lost all their matches. Thus, the score cannot be 0.

From point 3, all the teams scored different numbers of points in round 2. Thus, the lowest possible points are 1 and 2. Since A's total score is higher than D's (from point 5), A scored 2 points, and D scored 1 point in round 2. Thus, A had one loss and two draws, while D had two losses and one draw.

From point 4, the match between I and K was a draw. From all these points, we can deduce the results of games as follows.

I - K: Draw, I - A: I won, I - D: I won, K - A: Draw, K - D: K won and A - D: Draw.

Thus, the points table for round 2 becomes

Matches	Wins	Loss	Draw	Points
A	0	1	2	2
D	0	2	1	1
I	2	0	1	7
K	1	0	2	5

Ranking the teams based on the total score of the tournament, we get the table as follows.

Teams	Points	Rank
I, K	9	1
A	8	3
D	7	4
E	3	5
G, H, J	2	6
B, C, L	1	9
F	0	12

Thus, the difference between the points scored by the team ranked 3 and teams ranked 6 = 8 - 2 = 6.

40. What is the scoreline of the match between Kuwait and Lebanon?

A. 2 - 1

B. 4 - 2

C. 3 - 2

D. 1 - 1

Sol. Let the countries Austria, Brazil, Congo, Denmark, England, France, Germany, Hungary, India, Jakarta, Kuwait and Lebanon be denoted by A, B, C, D, E, F, G, H, I, J, K and L, respectively.

Each team plays once with every other team in its group. Thus, each group had three matches.

Group 4: J's both matches resulted in a draw, K's resulted in a win, and a draw and L's resulted in a loss and a draw. J's scorelines can only be (1 - 1) and (0 - 0), L's can only be (0 - 0) and (2 - 4), and K's can only be (4 - 2) and (1 - 1).

Match	Scoreline
J – K	1 – 1
J – L	0 – 0
K – L	4 – 2

Thus, the scoreline of match K - L is 4 - 2.

Hence, option B is the required answer.

Instructions

A video game called "Justice" lets the gamers play as various superheroes and villains from the popular MC comic universe. The below table provides values of the different attributes of the five most popular characters from the game.

Name	Attack	Defence	Health	Skill	Vitality	Kill
Crow-man	60		130			72
Superkid	100	140	160			
The Clown	40	130		30		
Green-Bulb	40	75	95			
Daywing				40	100	

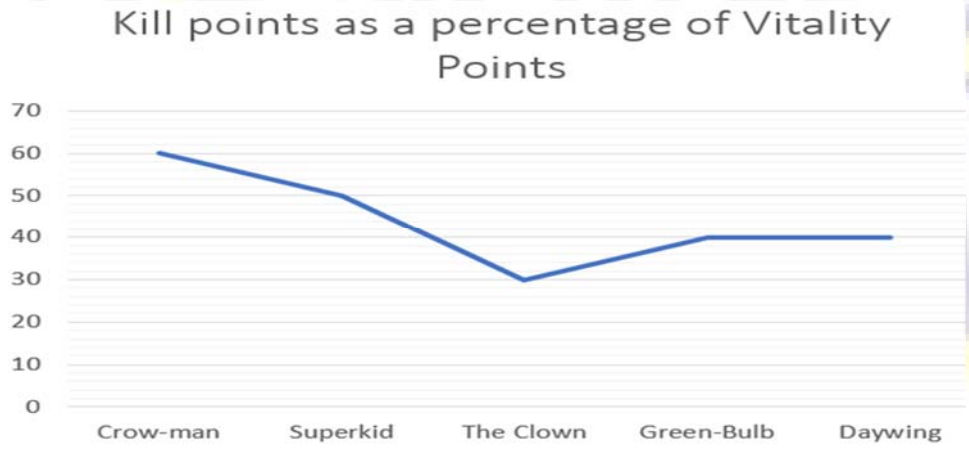
The vitality points depend upon the values of attack, defence and health points and are given as

Vitality points = 0.3(Attack points) + 0.4(Defence points) + 0.4(Health points)

Similarly, the kill points depend upon the values of attack and skill points and are given as

Kill points = 0.6(Attack points) + 0.4(Skill points)

The below chart shows the values of Kill points as a percentage of Vitality points for the five characters.



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

41. If the characters are ranked based on the "Kill points", with the highest KP corresponding to rank one and so on, which of the characters will be ranked fourth?

A. Crow-man

B. Daywing

C. The Clown

D. Green-Bulb

Sol. Using the data from the chart and representing it in the table as "K%V", we get the table as

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60		130			72	60
Superkid	100	140	160				50
The Clown	40	130		30			30
Green-Bulb	40	75	95				40
Daywing				40	100		40

In the case of Crow-man, the kill points are 60% of the vitality points. Thus, kill points = (72 x 100)/60 = 120

Using the formula for Kill points,

KP = 0.6(Attack) + 0.4(Skill)

72 = 0.6(60) + 0.4(Skill)

Skill = $\frac{(72-36)}{0.4}$ = 90

Using the formula for Vitality points,

VP = 0.3(Attack) + 0.4(Defense) + 0.4(Health)

120 = 0.3(60) + 0.4(Defense) + 0.4(130)

Defense = $\frac{(120-18-52)}{0.4}$

Defense = 125

Thus, the values of all the attributes of Crow-man are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60	125	130	90	120	72	60

In the case of Daywing,

K%V is 40% and VP = 100. Thus, KP = 0.4 x 100 = 40

KP = 0.6(Attack) + 0.4(Skill)

40 = 0.6(Attack) + 0.4(40)

Attack points = 24/0.6 = 40

VP = 0.3(Attack) + 0.4(Defence) + 0.4(Health)

100 = 0.3(40) + 0.4(Defense + Health)

Thus, Defense Points + Health Points = 88/0.4 = 220

Here, we cannot identify the DP and HP separately.

Thus, the values of all the attributes of Daywing are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Daywing	40	220		40	100	40	40

Similarly, you can calculate all the other values given in the table. The final table looks like this,

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60	125	130	90	120	72	60
Superkid	100	140	160	37.5	150	75	50
The Clown	40	130	140	30	120	36	30
Green-Bulb	40	75	95	20	80	32	40
Daywing	40	220		40	100	40	40

Ranking the characters based on the Kill points, we get

Name	Rank
Crow-man	2
Superkid	1
The Clown	4
Green-Bulb	5
Daywing	3

Thus, the character with rank four is “The Clown”. Hence, option C is the answer.

42. What is the ratio of skill points of Crow-man to Green-Bulb?

A. 2:9

B. 9:2

C. 4:1

D. 3:1

Sol. Using the data from the chart and representing it in the table as “K%V”, we get the table as

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60		130			72	60
Superkid	100	140	160				50
The Clown	40	130		30			30
Green-Bulb	40	75	95				40
Daywing				40	100		40

In the case of Crow-man, the kill points are 60% of the vitality points. Thus, kill points = (72 x 100)/60 = 120

Using the formula for Kill points,

KP = 0.6(Attack) + 0.4(Skill)

72 = 0.6(60) + 0.4(Skill)

Skill = $\frac{72-36}{0.4}$ = 90

Using the formula for Vitality points,

VP = 0.3(Attack) + 0.4(Defense) + 0.4(Health)

120 = 0.3(60) + 0.4(Defense) + 0.4(130)

Defense = $\frac{120-18-52}{0.4}$

Defense = 125

Thus, the values of all the attributes of Crow-man are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60	125	130	90	120	72	60

In the case of Daywing,

K%V is 40% and VP = 100. Thus, KP = 0.4 x 100 = 40

KP = 0.6(Attack) + 0.4(Skill)

40 = 0.6(Attack) + 0.4(40)

Attack points = 24/0.6 = 40

VP = 0.3(Attack) + 0.4(Defence) + 0.4(Health)

100 = 0.3(40) + 0.4(Defense + Health)

Thus, Defense Points + Health Points = 88/0.4 = 220

Here, we cannot identify the DP and HP separately.

Thus, the values of all the attributes of Daywing are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Daywing	40	220		40	100	40	40

Similarly, you can calculate all the other values given in the table. The final table looks like this,

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60	125	130	90	120	72	60
Superkid	100	140	160	37.5	150	75	50
The Clown	40	130	140	30	120	36	30
Green-Bulb	40	75	95	20	80	32	40
Daywing	40	220		40	100	40	40

Thus, the ratio of skill points of Crow man to Green-Bulb is = 90:20 = 9:2

Hence, option B is the answer.

43. Additional information: Two new characters are added to the game, as given below.

Name	Attack	Defence	Health	Skill	Vitality	Kill	KP x 100/VP
Martianhunter	100	100	75				80
Dr Destiny		200		150	200		60

If all the characters are ranked again based on their Kill points, what is the difference between the ranks of The Clown and Martianhunter?

Sol. Using the data from the chart and representing it in the table as "K%V", we get the table as

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60		130			72	60
Superkid	100	140	160				50
The Clown	40	130		30			30
Green-Bulb	40	75	95				40
Daywing				40	100		40
Martianhunter	100	100	75				80
Dr Destiny		200		150	200		60

In the case of Crow-man, the kill points are 60% of the vitality points. Thus, kill points = (72 x 100)/60 = 120

Using the formula for Kill points,

KP = 0.6(Attack) + 0.4(Skill)

72 = 0.6(60) + 0.4(Skill)

Skill = $\frac{72-36}{0.4}$ = 90

Using the formula for Vitality points,

VP = 0.3(Attack) + 0.4(Defense) + 0.4(Health)

120 = 0.3(60) + 0.4(Defense) + 0.4(130)

Defense = $\frac{120-18-52}{0.4}$

Defense = 125

Thus, the values of all the attributes of Crow-man are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60	125	130	90	120	72	60

In the case of Daywing,

K%V is 40% and VP = 100. Thus, KP = 0.4 x 100 = 40

KP = 0.6(Attack) + 0.4(Skill)

40 = 0.6(Attack) + 0.4(40)

Attack points = 24/0.6 = 40

VP = 0.3(Attack) + 0.4(Defence) + 0.4(Health)

100 = 0.3(40) + 0.4(Defense + Health)

Thus, Defense Points + Health Points = 88/0.4 = 220

Here, we cannot identify the DP and HP separately.

Thus, the values of all the attributes of Daywing are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Daywing	40	220		40	100	40	40

Similarly, you can calculate all the other values given in the table. The final table looks like this,

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V	Rank
Crow-man	60	125	130	90	120	72	60	4
Superkid	100	140	160	37.5	150	75	50	3
The Clown	40	130	140	30	120	36	30	6
Green-Bulb	40	75	95	20	80	32	40	7
Martianhunter	100	100	75	50	100	80	80	2
Dr Destiny	100	200	225	150	200	120	60	1
Daywing	40	220		40	100	40	40	5

Thus, the difference between the ranks of The Clown and Martianhunter = 6 - 2 = 4

44. Additional information: Two new characters are added to the game, as given below.

Name	Attack	Defence	Health	Skill	Vitality	Kill	KP x 100/VP
Martianhunter	100	100	75				80
Dr Destiny		200		150	200		60

What is the value of the Defense points of Dr. Destiny as a percentage of the Attack points of Superkid?

A. 100%

B. 50%

C. 125%

D. 200%

Sol. Using the data from the chart and representing it in the table as "K%V", we get the table as

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60		130			72	60
Superkid	100	140	160				50
The Clown	40	130		30			30
Green-Bulb	40	75	95				40
Daywing				40	100		40
Martianhunter	100	100	75				80
Dr Destiny		200		150	200		60

In the case of Crow-man, the kill points are 60% of the vitality points. Thus, kill points = (72 x 100)/60 = 120

Using the formula for Kill points,

KP = 0.6(Attack) + 0.4(Skill)

72 = 0.6(60) + 0.4(Skill)

Skill = $\frac{72-36}{0.4}$ = 90

Using the formula for Vitality points,

VP = 0.3(Attack) + 0.4(Defense) + 0.4(Health)

120 = 0.3(60) + 0.4(Defense) + 0.4(130)

Defense = $\frac{120-18-52}{0.4}$

Defense = 125

Thus, the values of all the attributes of Crow-man are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Crow-man	60	125	130	90	120	72	60

In the case of Daywing,

K%V is 40% and VP = 100. Thus, KP = 0.4 x 100 = 40

KP = 0.6(Attack) + 0.4(Skill)

40 = 0.6(Attack) + 0.4(40)

Attack points = 24/0.6 = 40

VP = 0.3(Attack) + 0.4(Defence) + 0.4(Health)

100 = 0.3(40) + 0.4(Defense + Health)

Thus, Defense Points + Health Points = 88/0.4 = 220

Here, we cannot identify the DP and HP separately.

Thus, the values of all the attributes of Daywing are

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V
Daywing	40	220		40	100	40	40

Similarly, you can calculate all the other values given in the table. The final table looks like this,

Name	Attack	Defence	Health	Skill	Vitality	Kill	K%V	Rank
Crow-man	60	125	130	90	120	72	60	4
Superkid	100	140	160	37.5	150	75	50	3
The Clown	40	130	140	30	120	36	30	6
Green-Bulb	40	75	95	20	80	32	40	7
Martianhunter	100	100	75	50	100	80	80	2
Dr Destiny	100	200	225	150	200	120	60	1
Daywing	40	220		40	100	40	40	5

The value of DP of Dr. Destiny to the AP of Superkid = $\frac{200}{100}$ × 100 = 200%

Hence, option D is the answer.

45. On a travelator(horizontal escalator), A is 120 m ahead of B when B starts. A is stationary, and B starts walking towards A. After 5 seconds, the distance between A and B is 90 m, and A starts moving. Both A and B exit the travelator at the same time. What is the length of travelator if speeds of A, B, travelator are in increasing A.P. with a common difference of 3 m/s

A. 360 m

B. 435 m

C. 645 m

D. 525 m

Sol. (Explanation is given with respect to a viewer on ground)

Let speeds of A, B and escalator be a, b, and e respectively

Distance travelled by A in 5 seconds = 5e

Distance travelled by B in 5 seconds = 5(b+e) = 5b + 5e

It is given, distance between A and B after 5 seconds is 90, i.e.

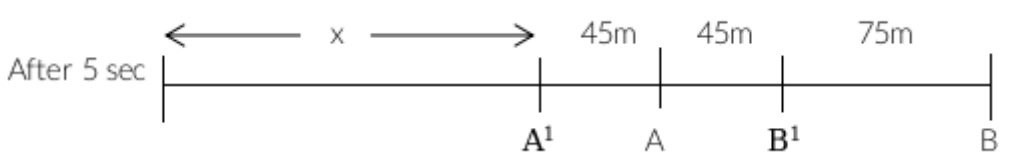
5b+5e-5e = 120-90

5b = 30

b = 6 m/s

It is given a, b, e are in increasing A.P with common difference 3

a = 3 m/s and e = 9 m/s



A travels x distance and B travels 90+x in same time

$\frac{x}{a+e} = \frac{90+x}{b+e}$

$\frac{x}{12} = \frac{90+x}{15}$

15x = 12x + 1080

3x = 1080

x = 360

Length of escalator = 360 + 45 + 120 = 525 m

Answer is option D

46. Rajesh started a cotton business investing Rs 45,000 and dropped after 14 months; Akash joined Rajesh after eight months and invested Rs 30,000. Suresh joined Akash after Rajesh left. If Akash received 33.33% profit after two years, find the amount of money invested by Suresh.

A. Rs 33,000

B. Rs 36,000

C. Rs 39,000

D. Rs 42,000

Sol. Rajesh has invested Rs 45,000 for 14 months, total money invested by Rajesh = Rs 45000(14)

Akash joined after 8 months and invested Rs 30,000, total money invested by Akash = Rs 30,000(16)

Suresh joined Akash after Rajesh left, this implies Suresh invested for 10 months.

Let the amount invested by Suresh be T

Akash received one-third of profit, i.e.

$$\frac{30,000(16)}{45,000(14)+30,000(16)+10T} = \frac{1}{3}$$

Solving we get

T = Rs 33,000

Answer is option A.

47. If the roots of a quadratic equation are the sum and product of roots of quadratic equation $3x^2 - 8x + 2 = 0$, at what value of x will the quadratic equation have its minima?

A. 5

B. 5/3

C. 10/3

D. 16/9

Sol. The roots of the required quadratic equation are the sum and product of the roots of equation $3x^2 - 8x + 2 = 0$. Thus, the roots are given by (-b/a) and (c/a).

Thus, the roots of the required quadratic equation are 8/3 and 2/3.

Sum of roots of required quadratic equation = 8/3 + 2/3 = 10/3

Product of roots of the required quadratic equation = 8/3 * 2/3 = 16/9

Thus, the required quadratic equation is $x^2 - (10/3)x + 16/9 = 0$ --> $9x^2 - 30x + 16 = 0$

The minima of a quadratic equation is obtained at x = -b/2a = 30/18 = 5/3.

Hence, option B is the answer.

48. a, b, x, y are real numbers such that $a^2 - b^2 = 144$ and $y^2 - x^2 = 196$. If ay - bx = 168 and ax - by = k, where k is a real number, what is the value of k?

A. $-\frac{1}{3}$

B. $\frac{1}{3}$

C. $\frac{12}{13}$

D. 0

Sol. ay - bx = 168

Squaring on both sides

$(ay)^2 + (bx)^2 - 2abxy = 168^2$ ...(1)

ax - by = k

Squaring on both sides

$(ax)^2 + (by)^2 - 2abxy = k^2$ ...(2)

Subtracting (2) from (1)

$a^2(y^2 - x^2) - b^2(y^2 - x^2) = 168^2 - k^2$

$(y^2 - x^2)(a^2 - b^2) = 168^2 - k^2$

$196 \times 144 = 168^2 - k^2$

$k^2 = 168^2 - 196 \times 144$

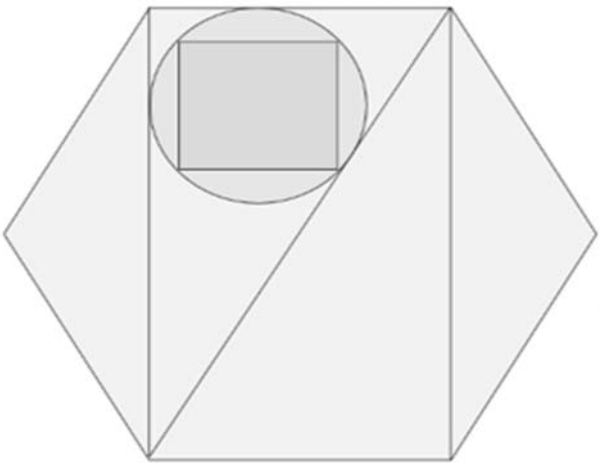
k = 0

Thus, ax - by = 0

ax = by

Hence, option D is the answer.

49. The figure shows a regular hexagon of sides of 's' units. Find the area of the square inscribed in the circle.



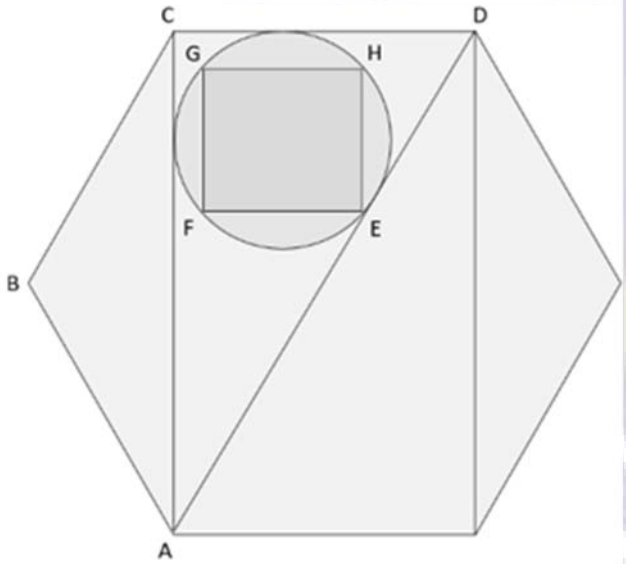
A. $(\sqrt{3}-1)s^2$

B. $(4-2\sqrt{3})s^2$

C. $(2-\sqrt{3})s^2$

D. $(3\sqrt{3}-2)s^2$

Sol.



In Triangle ABC, Angle ABC = 120°

Using the cosine rule,

$AB^2 + BC^2 - 2AB \times BC \times \cos(120) = AC^2$

$s^2 + s^2 - 2s^2(-\frac{1}{2}) = AC^2$

$AC^2 = 3s^2$

$AC = \sqrt{3}s$

In Triangle ACD, using the Pythagoras theorem

$AD^2 = AC^2 + CD^2$

$AD^2 = 3s^2 + s^2$

$AD = 2s$

Diagonal of the square = 2 × radius of the circle = 2 × inradius of triangle ACD = $2 \times \frac{\text{Area}}{\text{Semiperimeter}}$

$= 2 \times \frac{\frac{1}{2} \times s \times \sqrt{3}s}{\frac{1}{2}(s+2s+\sqrt{3}s)}$

$= 2 \times \frac{(\sqrt{3}s^2)}{\sqrt{3}(\sqrt{3}+1)s}$

$= \frac{2s}{\sqrt{3}+1}$

$= \frac{2s}{\sqrt{3}+1} \times \frac{\sqrt{3}-1}{\sqrt{3}-1}$

$= (\sqrt{3}-1)s$

Side of the square $= \frac{\text{diagonal}}{\sqrt{2}} = \frac{(\sqrt{3}-1)s}{\sqrt{2}}$

Area of square $= \left(\frac{(\sqrt{3}-1)s}{\sqrt{2}}\right)^2 = \frac{(3+1-2\sqrt{3})s^2}{2}$

$= (2 - \sqrt{3})s^2$

Hence, option C is the answer.

50. $3 \log_2 M - 6 = \log_2 N$ and $2 \log_3 N - 3 = \log_3 M$. What is the number of factors of $M^5 N^5$, if M and N are positive real numbers?

Sol. From the first equation, we get

$3 \log_2 M - 6 = \log_2 N$

$\log_2 \left(\frac{M^3}{N}\right) = 6$

$M^3 = 2^6 N$ ...(1)

Squaring on both sides,

$M^6 = 2^{12} N^2$ ....(2)

Considering the second equation

$2 \log_3 N - 3 = \log_3 M$

$\log_3 \left(\frac{N^2}{M}\right) = 3$

$N^2 = 3^3 M$ ...(3)

Putting this value in (2)

$M^6 = 2^{12} \times 3^3 M$

$M^5 = 2^{12} \times 3^3$

Raising (3) to the power of 5 on both sides.

$N^{10} = 3^{15} M^5$

$N^{10} = 3^{15} \times 2^{12} \times 3^3$

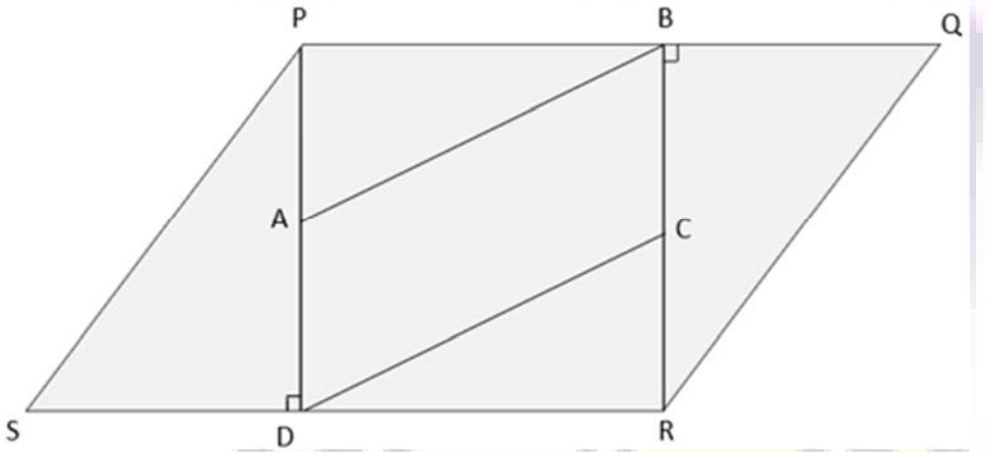
$N^5 = 2^6 \times 3^9$

Thus, $M^5 N^5 = 2^{12} \times 3^3 \times 2^6 \times 3^9 = 2^{18} \times 3^{12}$

Thus, the total number of factors = (18 + 1) (12 + 1) = 19 × 13 = 247.

Hence, the answer is 247.

51. In parallelogram PQRS, PD and BR are perpendicular to sides QP and SR, and points A and C are midpoints of PD and BR, respectively. If SR = 10units, PS = 6units and the area of PQRS = $30\sqrt{3}$ sq. units, find the area of quadrilateral ABCD rounded off to the closest integer.



A. 18

B. 26

C. 13

D. 19

Sol. Area of parallelogram PQRS = SR x PS x sin(Angle PSD) = $30\sqrt{3}$

10 x 6 x sin(Angle PSD) = $30\sqrt{3}$

$\sin(\text{Angle PSD}) = \frac{\sqrt{3}}{2}$

Angle PSD = 60^o

In triangle PSD,

$\sin(\text{Angle PSD}) = \frac{PD}{PS}$

$\sin(60) = \frac{PD}{6}$

$PD = 3\sqrt{3}$

$\cos(\text{Angle PSD}) = \frac{SD}{PS}$

$\cos(60) = \frac{SD}{6}$

SD = 3 units

.'. DR = SR - SD = 10 - 3 = 7units = PB

Points A and C are midpoints of PD and BR.

Thus, $PA = AD = BC = CR = \frac{1}{2} \times 3\sqrt{3} = \frac{3\sqrt{3}}{2}$

Area of quadrilateral PBRD = PB x PD = 7 x $3\sqrt{3} = 21\sqrt{3}$

Area of triangle BPA = ½ x BP x PA = $\frac{1}{2} \times 7 \times 3\sqrt{3} = 21\sqrt{3}$

Similarly, Area of triangle CDR = $\frac{21\sqrt{3}}{4}$

Thus, Area of quadrilateral ABCD = Area(PBRD) - Area(△ BPA) - Area(△ CDR)

$= 21\sqrt{3} - \frac{21\sqrt{3}}{4} - \frac{21\sqrt{3}}{4}$

$= \frac{21\sqrt{3}}{2}$

$= 21 \text{ x } 1.73 \text{ x } \frac{1}{2}$

$= 18.165$

$\approx$ 18sq.units

Hence, option A is the required answer.

52. Authorities of a garden have decided to plant more plants and grew 30% flowering plants, and the remaining are non-flowering plants. Out of flowering plants, 30% are roses, 40% are Hibiscus, and the remaining are neem. Of non-flowering plants, 40% are pines, and the remaining are yews. The number of yews plants is how much percent greater than Hibiscus plants?

A. 150%

B. 250%

C. 200%

D. 350%

Sol. Let the number of total plants be T

Number of rose plants = 0.3 × 0.3T = 0.09T

Number of Hibicus plants = 0.4 × 0.3T = 0.12T

Number of neem plants = 0.3 × 0.3T = 0.09T

Number of pines = 0.4 × 0.7T = 0.28T

Number of Yews = 0.6 × 0.7T = 0.42T

Percentage required = $\frac{0.42T - 0.12T}{0.12T} \times 100 = 250\%$

Answer is option B.

53. 6 men and 9 women can complete the work in 2 days. Three men take one day less than four women to complete the work. In how many days can one man and one woman complete the work?

A. 7.2

B. 25.2

C. 12.6

D. 14.4

Sol. Let time taken by one man to complete the work be 'M' and woman be 'W'

It is given 6 men and 9 women can finish the work in 2 days

$\frac{6}{M} + \frac{9}{W} = \frac{1}{2}$ ..... (1)

$\frac{W}{4} + \frac{M}{3} = 1$ ..... (2)

Solving (1) and (2), we get

M = 24 and W = 36

Let the total work be 72 units (LCM 24, 36)

Work done by 1 man in a day = $\frac{72}{24}$ = 3 units

Work done by 1 woman in a day = $\frac{72}{36}$ = 2 units

Time taken by 1 man and 1 woman = $\frac{72}{2+3} = \frac{72}{5}$ = 14.4 days

The answer is option D.

54. The thirteenth term of an arithmetic progression (A1) is -23, and its forty-eighth term is 25. What is the tenth term of a different arithmetic progression (A2) whose common difference is 5, and the first term is the sum of the first sixty terms of A1?

Sol. Let the first term and common difference of the given AP be 'a' and 'd'. Thus,

a + 12d = -23

a + 47d = 25

Adding both the terms we get,

2a + 59d = 2

We have to find the tenth term of an AP whose first term equals the sum of the first 60 terms of the above AP.

First term = S_{60} = 60/2 * [2a + 59d] = 60/2 * 2 = 60.

Thus, the tenth term of the required AP = 60 + (10 - 1)*5 = 60 + 45 = 105

55. When Rs. 3.2 lakhs is invested for two years, the difference between simple interest and compound interest at the same rate of interest is Rs 20,000. Find the rate of interest?

A. 20%

B. 25%

C. 35%

D. 40%

Sol. Compound interest = $P\left(1+\frac{r}{100}\right)^2 - P$

Simple interest = $\frac{2Pr}{100}$

C.I - S.I = 20,000

$P\left(1+\frac{r}{100}\right)^2 - P - \frac{2Pr}{100} = 20{,}000$

$P\left(\frac{r}{100}\right)^2 = 20{,}000$

$\left(\frac{r}{100}\right)^2 = \frac{20000}{320000}$

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

r = 25%

Answer is option B.

56. A can complete a task in 12 days, B can complete a task in 16 days, and C is 50% less efficient than A. A, B and C start working on a task together. A and C work on day 2, B and C work on day 1 and all of them work on day 3; this continues till they finish the task. Find the amount earned by A if it is known that C earned Rs 13,500 on completing the task.

A. Rs 18,900

B. Rs 16,200

C. Rs 43,200

D. Rs 27,000

Sol. A can complete the task in 12 days, and B can complete the task in 16 days.

It is mentioned that C is 50% less efficient than A; this implies that C takes twice the time taken by A

C can complete the task in 24 days

Let the total amount of work be 48 units (LCM 12,16,24)

Work done by A in 1 day = $\frac{48}{12}$ = 4 units

Work done by B in 1 day = $\frac{48}{16}$ = 3 units

Work done by C in 1 day = $\frac{48}{24}$ = 2 units

Work done by B and C on day 1 = 3 + 2 = 5 units

Work done by A and C on day 2 = 4 + 2 = 6 units

Work done by all of them on day 3 = 4 + 3 + 2 = 9 units

Work done in 3 days = 5 + 6 + 9 = 20 units

Work done in 6 days = 2 × 20 = 40 units

On day 7, B and C will work and finish 5 units

work left = 48 - 40 - 5 = 3 units

A and C will work for half day on day 8 to finish the work

Total time taken = $7\frac{1}{2}$ days

C works on all the day, work done by C = $\frac{15}{2} \times 2 = 15$ units

B works for 5 days, work done by B = $5 \times 3 = 15$ units

A works for 4 days and a half day, work done by A = 4(4) + 2 = 18 units

Amount earned by A = $\frac{18}{15} \times 13{,}500$ = Rs 16,200

Answer is option B.

57. MFS conducted interviews for all shortlisted students at their campus. There is a total of 180 students shortlisted. All the students are divided equally into two batches. The ratio of the number of females who did not attend the interview to the number of males who did not attend the interview for batch 1 is 2:7 and for batch 2 is 5:4. 85% of the shortlisted students attended the interview. If the number of males who did not attend the interview is double the number of females who did not attend, find the number of males who did not attend the interview from the second batch

Sol. There is a total of 180 students shortlisted and divided equally into two batches. This implies each batch has 90 students.

Number of students not attended in batch 1 = y

Number of students attended in batch 1 = 90-y

Number of students not attended in batch 2 = x

Number of students attended in batch 2 = 90-x

It is given,

85% of shortlisted have attended the interview, i.e. $0.85 \times 180 = 153$ students attended the interview

90-y+90-x = 153

x+y = 27

Number of females not attended: number of males not attended = 2 : 7(batch 1)

Let the number of females not attended in batch 1 be 2m

number of males not attended in batch 1 = 7m

y = 9m

Number of females not attended: number of males not attended = 5 : 4(batch 2)

Let the number of females not attended in batch 2 be 5n

number of males not attended in batch 2 = 4n

x = 9n

It is given that,

7m + 4n = 2(2m + 5n)

7m + 4n = 4m + 10n

3m = 6n

m = 2n

x + y = 27

9n + 18n = 27

n = 1, m = 2

Number of males who did not attend the interview from the second batch = 4n = 4

58. Time taken by Kamal to go from A to B, i.e. against the stream is 12 seconds. Find the time taken(in minutes) by Kamal to travel from B to A, if it is known that the ratio of Kamal's speed in still water to the speed of the stream is 8 : 5

A. $\frac{36}{13}$

B. $\frac{24}{13}$

C. $\frac{3}{65}$

D. $\frac{7}{65}$

Sol. Let the distance travelled by Kamal be 'D' and Kamal's speed in still water be 8x

Speed of stream = 5x

Time taken by Kamal to travel against the stream = $\frac{D}{8x-5x} = \frac{D}{3x}$

Given,

$\frac{D}{3x}$ = 12

$\frac{D}{x}$ = 36

Time taken by Kamal to travel along the stream = $\frac{D}{8x+5x} = \frac{D}{13x} = \frac{36}{13} sec = \frac{36}{13\times60} = \frac{3}{65}$ minutes

The answer is option C.

59. How many triangles with integer sides can be formed whose perimeter is 9 cm?

Sol. Given, perimeter = 9 cm

Only one equilateral triangle is possible whose side is 3 cm

Isosceles triangles:

Let the sides of triangle be a, a, b

2a + b = 9

sum of two sides of triangle is greater than third side

2a > b and b > 0

2a + b = 9

Only possibilities are

2a = 8, b = 1

2a = 6, b = 3 (is a equilateral triangle)

Number of triangles possible with exactly two equal sides = 1

Scalene triangles:

Let the sides of triangle be a, b, c

sum of two sides of triangle is greater than third side

a + b > c

a + b + c > 2c

$c < \frac{a+b+c}{2}$

Each side of triangle is less than its semi-perimeter

a, b, c < 4.5

only possibility is 4, 3, 2

Therefore, total number of possible triangles = 3

60. How many integral values of x satisfy the inequality $\frac{x^3-6x^2+5x}{x^2+8x+7} \leq 0$ such that $|x| \leq 10$?

Sol. $|x| \leq 10$

Thus, x can take values in the range [-10, 10].

The given inequality is $\frac{x^3-6x^2+5x}{x^2+8x+7} \leq 0$

Breaking the numerator and denominator into their factors, we get $\frac{x(x-1)(x-5)}{(x+7)(x+1)}$

The boundary points for this inequality are -7, -1, 0, 1 and 5. We will have to check the sign of the expression in the regions around these boundary points.

for $-10 \leq x \leq -7$: taking x = -8,

the expression becomes $\frac{(-8)(-9)(-13)}{(-1)(-7)}$

The value of the expression is negative in this region.

Similarly checking for other regions, we get

for $-7 \leq x \leq -1$: positive

for $-1 \leq x \leq 0$: negative

for $0 \leq x \leq 1$: positive

for 1\le\≤ x\le\≤ 5: negative

for $5 \leq x \leq 10$: positive

Thus, the possible values of x are -10, -9, -8, -7, -1, 0, 1, 2, 3, 4, 5; a total of 11 values.

But, at x = -1 and x = -7, the denominator becomes 0. Thus, they are rejected.

Therefore, the values of x satisfying the inequality are -10, -9, -8, 0, 1, 2, 3, 4, 5; a total of 9 values.

Hence, the answer is 9.

Alternately,

The sign of an expression alternates between positive and negative when consecutive ranges are considered.

First finding the sign for $-10 \leq x \leq -7$: we get negative. Thus, the subsequent signs become:

for $-7 \leq x \leq -1$: positive

for $-1 \leq x \leq 0$: negative

for $0 \leq x \leq 1$: positive

for $1 \leq x \leq 5$: negative

for $5 \leq x \leq 10$: positive

Thus, the possible values of x satisfying the inequality are -10, -9, -8, 0, 1, 2, 3, 4, 5; a total of 9 values.

61. A wholesaler sold ten mangoes to a shopkeeper at 50% profit, and the shopkeeper sold six mangoes to a customer at 40% profit. Find the price at which the wholesaler bought a mango if it is known that the customer would have saved Rs 900 if he purchased the mangoes directly from the wholesaler.

A. Rs 275

B. Rs 300

C. Rs 350

D. Rs 250

Sol. Let the cost price of wholesaler for a mango be 100C.P

Cost price of wholesaler for 10 mangoes = 1000C.P

Wholesaler sold mangoes at 50% profit

Hence, selling price of wholesaler for 10 mangoes = 1.5×1000C.P = 1500C.P

Cost price of shopkeeper for 10 mangoes = 1500C.P

Cost price of shopkeeper for 6 mangoes = 900C.P

Shopkeeper sold mangoes at 40% profit

Selling price of shopkeeper for 6 mangoes = 1.4×900C.P = 1260C.P

It is given,

1260C.P - 900C.P = 900

360C.P = 900

C.P = 2.5

Therefore, cost price of wholesaler for a mango = 2.5 ×100 = Rs 250

Answer is option D.

62. Find the remainder when 41^{13} is divided by 11

A. 3

B. 4

C. 6

D. 9

Sol. $R\left(\frac{41^{13}}{11}\right) = R\left(\frac{(33+8)^{13}}{11}\right) = R\left(\frac{8^{13}}{11}\right)$

$R\left(\frac{8^{13}}{11}\right) = R\left(\frac{2^{39}}{11}\right) = R\left(\frac{(2^5)^7}{11}\right) R\left(\frac{2^4}{11}\right)$

$R\left(\frac{(2^5)^7}{11}\right) R\left(\frac{2^4}{11}\right) = R\left(\frac{(-1)(5)}{11}\right) = R\left(-\frac{5}{11}\right) = 6$

Answer is option C

63. Ramesh is practising for a hurdle race organised by his school. He has five hurdles for practising. The probability of Ramesh successfully jumping over a hurdle is $\frac{1}{3}$. What is the ratio of the probability that Ramesh jumps over at least two hurdles to the probability that Ramesh jumps over all the hurdles successfully?

A. 1

B. $\frac{32}{243}$

C. 131

D. $\frac{131}{243}$

Sol. The probability that Ramesh successfully jumps over a hurdle is 1/3. Thus, the probability of Ramesh's failure = 1 - 1/3 = 2/3

Probability of Ramesh jumping over all the hurdles = $(1/3)^5$ = 1/243

Probability of Ramesh jumping over at least 2 hurdles = P = 1 - (probability of Ramesh failing 5 times + probability of Ramesh jumping only 1 hurdle)

Probability of Ramesh failing all 5 times = $(2/3)^5$ = 32/243

Probability of Ramesh jumping over only 1 hurdle successfully = 5 x $(1/3)(2/3)^4$ = 80/243

Thus, P = 1 - 32/243 - 80/243 = 1 - 112/243 = 131/243

Thus, the required ratio = (131/243):(1/243) = 131

Hence, option C is the answer.

64. If 300 ml of solution A is mixed with 500 ml of solution B, find the non-alcoholic percentage in the resultant solution if it is known that alcohol percentage in B and A is 30% and 40% respectively

A. 66.25%

B. 33.75%

C. 36.25%

D. 63.75%

Sol. Alcohol percentage in A = 40%

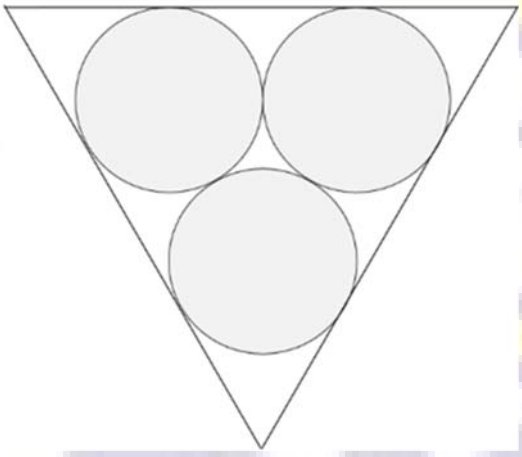
Alcohol percentage in B = 30%

Alcohol percentage in resultant solution = $\frac{40(300) + 30(500)}{300 + 500} = 33.75\%$

Non-alcoholic percentage = 100 - 33.75 = 66.25%

Answer is option A.

65. Three circles of equal radii 'r' are touching each other, as shown in the figure. A triangle is formed by joining the common tangents of the circles. What is the ratio of the area of the triangle formed by joining the centres of the three circles to the exterior triangle given?



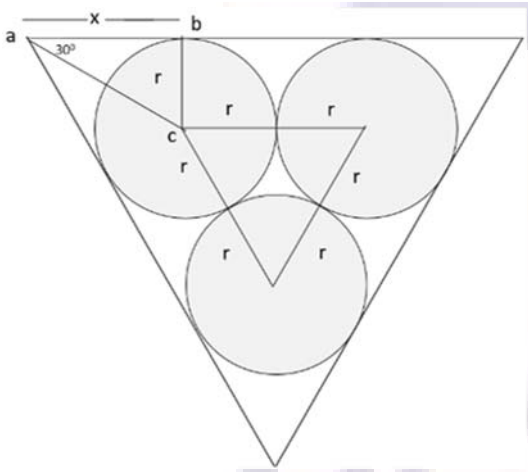
A. $\frac{1}{4-2\sqrt{3}}$

B. $\frac{1}{2-4\sqrt{3}}$

C. $\frac{1}{4+2\sqrt{3}}$

D. $\frac{1}{2+4\sqrt{3}}$

Sol. From the information given in the question, we get the figure as follows.



As shown in the above figure, the triangle formed by joining the centres of the three circles is an equilateral triangle with side = r + r = 2r.

Thus, area of triangle = $\frac{\sqrt{3}}{4} \times (2r)^2 = \frac{\sqrt{3}}{4} \times 4r^2$

The triangle formed by joining the common tangents of the circles is also an equilateral triangle with side = x + r + r + x = 2x + 2r

In triangle abc, angle b = 90°, ab = x, bc = r and angle bac = 30°

$\tan(30^\circ) = \frac{1}{\sqrt{3}}$ = bc/ab = r/x

$x = r \times \sqrt{3}$

Thus, side of the outer triangle = $2x + 2r = 2\sqrt{3}r + 2r = 2r(\sqrt{3} + 1)$

Thus, area of outer triangle = $\frac{\sqrt{3}}{4} \times [2r(\sqrt{3} + 1)]^2 = \frac{\sqrt{3}}{4} \times 4r^2 \times [4 + 2\sqrt{3}]$

Thus, the ratio of areas of the inner triangle to the outer triangle = $\frac{\left(\frac{\sqrt{3}}{4} \times 4r^2\right)}{\frac{\sqrt{3}}{4} \times 4r^2 \times [4 + 2\sqrt{3}]} = \frac{1}{4 + 2\sqrt{3}}$

Hence, option C is the answer.

66. Amal and Bimal are playing "Get the sixer" game. In each turn, a player rolls a regular die with faces numbered 1 - 6, and the first player to roll a 6 wins the game. If Amal had the first turn, what is Bimal's probability of winning the game?

A. $\frac{5}{36}$

B. $\frac{5}{11}$

C. $\frac{125}{1296}$

D. $\frac{31}{36}$

Sol. The die has numbers 1 - 6 on its sides. Thus, the probability of rolling any number from 1 - 6 is $\frac{1}{6}$.

Amal had the first turn. Thus, Bimal can win on the second, fourth, sixth, ... turns.

Case 1: Bimal wins on the second turn of the game.

For Bimal to win on his turn, Amal would have to have rolled a number other than 6.

Thus, probability of Bimal winning = $\frac{5}{6} \times \frac{1}{6} = \frac{5}{36}$

Case 2: Bimal wins on the fourth turn of the game.

For Bimal to win on the fourth turn, they would have rolled numbers other than 6 on the first three turns.

Thus, the probability of winning on the fourth turn = $\frac{5}{6} \times \frac{5}{6} \times \frac{5}{6} \times \frac{1}{6} = \left(\frac{5}{6}\right)^3 \left(\frac{1}{6}\right)$

Case 3: Bimal wins on the sixth turn of the game.

For Bimal to win on the sixth turn of the game, the first five turns will have rolled numbers other than 6.

Thus, the probability of winning on the sixth turn = $\left(\frac{5}{6}\right)^5 \left(\frac{1}{6}\right)$

Thus, the probability of Bimal winning the game forms an infinite GP with the first term $\left(\frac{5}{36}\right)$ and the common ratio $\left(\frac{5}{6}\right)^2$.

Thus, the probability of Bimal winning the game = $\frac{\frac{5}{36}}{1-\frac{25}{36}} = \frac{\frac{5}{36}}{\frac{11}{36}} = \frac{5}{11}$

Hence, option B is the answer.

Alternate Solution:

For Bimal to win, there are two ways: Either he wins on the first chance he gets or on any of the other ones.

Let the probability of Bimal winning be denoted by P.

The probability of Bimal winning in his first turn = $\frac{5}{6} \times \frac{1}{6}$

The probability of Bimal winning in any other turn = $\frac{5}{6} \times \frac{5}{6} \times P$ [Since after the first two turns, it will again be Amal's turn]

Thus, the overall probability = P = $\left(\frac{5}{6} \times \frac{1}{6}\right) + \left(\frac{5}{6} \times \frac{5}{6} \times P\right)$

$P - \frac{25}{36} P = \frac{5}{36}$

$\frac{11}{36} P = \frac{5}{36}$

Thus, $P = \frac{5}{11}$

Hence, the probability of Bimal winning the game is $\frac{5}{11}$.