

CAT 2025 Slot - II

SECTION: VERBAL ABILITY AND READING COMPREHENSION

DIRECTIONS for questions 1-4: The passage below is accompanied by a set of questions. Choose the best answer to each question.

Time and again, whenever a population [of Mexican tetra fish] was swept into a cave and survived long enough for natural selection to have its way, the eyes disappeared. "But it's not that everything has been lost in cavefish . . . Many enhancements have also happened." . . . Studies have found that cave-dwelling fish can detect lower levels of amino acids than surface fish can. They also have more tastebuds and a higher density of sensitive cells alongside their bodies that let them sense water pressure and flow. . . .

Killing the processes that support the formation of the eye is quite literally what happens. Just like non-cavedwelling members of the species, all cavefish embryos start making eyes. But after a few hours, cells in the developing eye start dying, until the entire structure has disappeared. [Developmental biologist Misty] Riddle thinks this apparent inefficiency may be unavoidable. "The early development of the brain and the eye are completely intertwined-they happen together," she says. That means the least disruptive way for eyelessness to evolve may be to start making an eye and then get rid of it. . . .

It's easy to see why cavefish would be at a disadvantage if they were to maintain expensive tissues they aren't using. Since relatively little lives or grows in their caves, the fish are likely surviving on a meager diet of mostly bat feces and organic waste that washes in during the rainy season. Researchers keeping cavefish in labs have discovered that, genetically, the creatures are exquisitely adapted to absorbing and storing nutrients.

Fats can be toxic for tissues, [evolutionary physiologist Nicolas] Rohner explains, so they are stored in fat cells. "But when these cells get too big, they can burst, which is why we often see chronic inflammation in humans and other animals that have stored a lot of fat in their tissues." Yet a 2020 study by Rohner, Krishnan and their colleagues revealed that even very well-fed cavefish had fewer signs of inflammation in their fat tissues than surface fish do. Even in their sparse cave conditions, wild cavefish can sometimes get very fat, says Riddle. This is presumably because, whenever food ends up in the cave, the fish eat as much of it as possible, since there may be nothing else for a long time to come. Intriguingly, Riddle says, their fat is usually bright yellow, because of high levels of carotenoids, the substance in the carrots that your grandmother used to tell you were good for your...eyes.

"The first thing that came to our mind, of course, was that they were accumulating these because they don't have eyes," says Riddle. In this species, such ideas can be tested: Scientists can cross surface fish (with eyes) and cavefish (without eyes) and look at what their offspring are like. When that's done, Riddle says, researchers see no link between eye presence or size and the accumulation of carotenoids. Some eyeless cavefish had fat that was practically white, indicating lower carotenoid levels. Instead, Riddle thinks these carotenoids may be another adaptation to suppress inflammation, which might be important in the wild, as cavefish are likely overeating whenever food arrives.

1. Which one of the following results for the cross between surface fish (with eyes) and cavefish (without eyes) would invalidate Riddle's inference from the experiment?
 1. Some offspring with eyes had white fat.
 2. Some offspring with eyes had yellow fat.
 3. Some eyeless offspring had white fat.
 4. Only eyeless offspring had yellow fat.

Answer: 4

Explanation: Riddle's inference, based on the cross-breeding experiment, is that there is no link between eye presence/absence and the accumulation of carotenoids (which turn fat yellow). This conclusion is supported by the observation that some eyeless cavefish had white fat (low carotenoids), showing that eye loss does not necessarily lead to carotenoid buildup.

If the experiment instead showed that only eyeless offspring had yellow fat, this would establish a strict correlation between the absence of eyes and high carotenoid levels. Such a result would directly contradict Riddle's inference that there is no connection, because it would suggest that eye loss is consistently associated with carotenoid accumulation. Therefore, this outcome would invalidate her conclusion. The other options are consistent with Riddle's inference:

Options 1 and 2 show that fish with eyes can have either white or yellow fat, indicating no clear link. Option 3 (some eyeless offspring with white fat) is explicitly mentioned in the passage as evidence supporting Riddle's view.

Thus, only option 4 would undermine Riddle's inference.

2. Which one of the following best explains why the "apparent inefficiency" is "unavoidable"?
 1. The lack of light in the caves kills the eye cells in the developing Mexican tetra cavefish embryo.
 2. The inefficiency resulting from eyelessness is compensated by enhancements like more tastebuds in Mexican tetra cavefish.
 3. Mexican tetra cavefish are similar to non-cave-dwelling variants in their early stages of development.
 4. The caves have poor and inconsistent availability of food and nutrition for Mexican tetra cavefish.

Answer: 4

Explanation: The "apparent inefficiency" refers to the fact that cavefish embryos begin to form eyes, only for the eye cells to die later. According to Riddle, this is unavoidable because the early development of the brain and the eye are completely intertwined—they occur together in all members of the species. Since the basic developmental program is shared with surface fish, the least disruptive evolutionary path to eyelessness is to start the eye-formation process and then abort it, rather than trying to eliminate eye

development from the outset. Option 3 correctly identifies this shared early developmental stage as the reason the inefficiency cannot be avoided.

Option 1 is incorrect; the passage does not attribute eye-cell death to the lack of light.

Option 2 describes a compensation for losing eyes, but does not explain why the inefficient process itself is unavoidable.

Option 4 addresses the ecological pressure that favors losing eyes, but not why the developmental process remains inefficient.

3. On the basis of the information in the passage, what is the most likely function of carotenoids in Mexican tetra cavefish?
1. To render bright yellow colour to the cavefish.
 2. To act as a substitute for eyes.
 3. To help the fat cells store nutrients.
 4. To control inflammation from the bursting of fat cells.

Answer: 4

Explanation: The passage explicitly states that Riddle hypothesizes carotenoids "may be another adaptation to suppress inflammation," which is important because cavefish often overeat when food is available, leading to enlarged fat cells that can burst and cause inflammation. This directly supports option 4.

Option 1 describes a visible effect (yellow color) but not the functional purpose.

Option 2 is considered and rejected by the experiment showing no link between eye loss and carotenoid accumulation.

Option 3 is not mentioned; the passage discusses nutrient absorption and storage as separate adaptations, not linked to carotenoids.

Thus, based on the passage, the most likely function of carotenoids is to control inflammation.

4. All of the following statements from the passage describe adaptation in Mexican tetra cavefish EXCEPT:
1. "Since relatively little lives or grows in their caves, the fish are likely surviving on a meager diet of mostly bat feces and organic waste that washes in during the rainy season."
 2. "But when these cells get too big, they can burst, which is why we often see chronic inflammation in humans and other animals that have stored a lot of fat in their tissues."
 3. "It's easy to see why cavefish would be at a disadvantage if they were to maintain expensive tissues they aren't using."
 4. "Even in their sparse cave conditions, wild cavefish can sometimes get very fat, says Riddle."

Answer: 2

Explanation: The question asks which statement does not describe an adaptation in Mexican tetra cavefish. Adaptations are specific traits that have evolved through natural selection to enhance survival in the cave environment. Option 1 describes the cave environment and the fish's diet. While it doesn't name a trait, it describes the selective pressure (scarce food) that drove adaptations like efficient nutrient absorption. It is part of the adaptive narrative.

Option 2 is a general biological statement about fat cells and inflammation in humans and other animals. It is used to introduce a common problem, not to describe a specific adaptation of the cavefish. The adaptation is revealed in the next sentence, where the passage states that cavefish have fewer signs of inflammation despite this general risk. Therefore, this quoted line itself is not about cavefish adaptation.

Option 3 directly explains the adaptive rationale for losing eyes-maintaining unused "expensive tissues" is a disadvantage in a resource-poor cave.

Option 4 describes the cavefish's behavioral and physiological adaptation of overeating and storing fat when food is available, a crucial survival strategy in their feast-or-famine environment.

Thus, only Option 2 does not describe an adaptation in the cavefish; it provides a comparative biological context.

DIRECTIONS for the question 5: Five jumbled sentences (labelled 1, 2, 3, 4, and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence out and key in the number of that sentence as your answer.

5.

1. Sporting a copper-coloured pixie cut and a pair of pink feather antlers, Torres himself resembles a child's doodle.
2. His casual millennial delivery, peppered with "um"s and "ah"s, makes surreal concepts sound like items on a brunch menu.
3. Though he may have failed so far in his colour-scouting mission (he hasn't yet found a new one, he admits), this hour leaves you tickled pink.
4. Like his previous show, My Favourite Shapes, this is an hour of sit-down comedy aided by an overhead camera which relays Torres's theories - illustrated with crayon squiggles - on to a screen behind him.
5. His inquisitive mind produces interconnected ideas about Catholicism, the blandness of Pixar and what orange sounds like, while his insights train us to spot "highly purple behaviour".

Answer: 3

Explanation: Sentences 4, 1, 2, and 5 form a coherent paragraph that introduces the show's format, describes Torres's appearance and delivery style, and details the content of his comedy.

Sentence 3, with its evaluative tone and reference to a "colour-scouting mission" that isn't mentioned elsewhere, breaks this descriptive flow and reads like a concluding remark or external review rather than part of the same descriptive sequence.

DIRECTIONS for the question 6: The four sentences (labelled 1, 2, 3, and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.

6.

1. As books age, the cellulose and lignin in the paper begin to break down, releasing a mix of volatile organic compounds into the air.
2. Old books carry a scent that many people instantly recognize-and even love.
3. These compounds are benzaldehyde, which gives off an almond-like scent, vanillin, which smells like vanilla, ethyl hexanol (floral scent), toluene (sweet), and furfural (which has a slightly bready scent).
4. This familiar aroma isn't just dust or mildew; it's actually a result of slow chemical changes happening inside the paper and ink.

Answer: 2,4,3,1

Explanation: We need a logical flow. Probably start with introducing the scent of old books (sentence 2). Then sentence 4 can follow, clarifying that it's not dust but chemical changes. Then sentence 1 explains the chemical changes: breakdown of cellulose and lignin releasing compounds. Then sentence 3 lists the specific compounds.

So order: 2, 4, 1, 3.

DIRECTIONS for the question 7: The given sentence is missing in the paragraph below. Decide where it best fits among the options 1, 2, 3, or 4 indicated in the paragraph.

7. **Sentence:** The region's Western customers found it hard to believe that Dhaka muslin could possibly have been made by human hands - there were rumour that it was woven by mermaids, fairies and even ghosts.

Paragraph: Once upon the silty banks of the Meghna River, a miracle was spun - a fabric so light it was called "baft-hawa", or woven air. This was Dhaka Muslin - the world's most coveted cloth.

____(1) _____. Handspun from a rare cotton called Phuti Karpas, found nowhere else on Earth, and woven with a 16 -step sacred ritual - beginning with cleaning the cotton using the teeth of a river catfish! ____ (2) _____. Every spring, the maple-like leaves pushed up through the grey, silty soil to produce a single daffodilyellow flower twice a year, which gave way to a snowy floret of cotton fibres. ____ (3) _____. Spun at dawn on boats by sharp-eyed young women, its threads were so fine the elderly could barely see them. Motifs of wildflowers, river breeze, and soul were etched into each piece - some so light, a 91-metre bolt could pass through a ring, or a 60' length fit inside a snuffbox. It draped Greek goddesses, Roman nobles, Mughal emperors, and European aristocrats. Marie Antoinette, Empress Joséphine - even Jane Austen adored its floating grace. ____ (4) _____.

1. Option 1

2. Option 2
3. Option 3
4. Option 4

Answer:1

Explanation: The missing sentence describes Western customers' disbelief in the human origin of Dhaka muslin, attributing it to mythical weavers like mermaids or fairies. This fits best at position 1, immediately after the opening description of the fabric as a "miracle" and "woven air." Placing it here logically extends the sense of wonder and introduces the rumor before the paragraph details the actual, intricate human process involved in creating the muslin. Inserting it later would disrupt the flow of the technical and historical details that follow.

DIRECTIONS for the question 8: Five jumbled sentences (labelled 1, 2, 3, 4, and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence out and key in the number of that sentence as your answer.

8.

1. Pfas are a class of about 15,000 compounds most frequently used to make products water-, stainand grease-resistant.
2. New research suggests exposure to some common perfluoroalkyl and polyfluoroalkyl substances (Pfas) cause changes to gene activity and that these changes are linked to health problems including multiple cancers, neurological disorders and autoimmune disease.
3. These Pfas compounds are dubbed "forever chemicals" because they do not naturally break down in the environment. 4. The research may also point toward other diseases potentially caused by Pfas that have not yet been identified.
4. The findings are a major step toward determining the mechanism by which the chemicals cause disease and could help doctors identify, detect and treat health problems for those exposed to Pfas before the issues advance.

Answer: 3

Explanation: Sentences 1, 2, 4, and 5 form a coherent paragraph focused on the health implications of PFAS exposure and the significance of recent research:

Sentence 1 introduces PFAS and their common uses.

Sentence 2 presents new research linking PFAS to health problems via changes in gene activity.

Sentence 4 extends the research by suggesting it may reveal other unidentified diseases.

Sentence 5 discusses the practical importance of the findings for diagnosis and treatment.

Sentence 3, while factually correct, shifts the focus to the environmental persistence of PFAS (why they are called "forever chemicals"). This interrupts the logical flow of the paragraph, which is centered on health effects and research outcomes rather than environmental characteristics. Therefore, sentence 3 is the odd one out.

DIRECTIONS for questions 9-12: The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Different sciences exhibit different science cultures and practices. For example, in astronomy, observation - until what is today called the new astronomy - had always been limited to what could be seen within the limits of optical light. Indeed, until early modernity the limits to optical light were also limits of what humans could themselves see within their limited and relative perceptual spectrum of human vision. With early modernity and the invention of lensed optical instruments - telescopes - astronomers could begin to observe phenomena never seen before. Magnification and resolution began to allow what was previously imperceptible to be perceived - but within the familiar limits of optical vision. Galileo, having learned of the Dutch invention of a telescope by Hans Lippershey, went on to build some hundred of his own, improving from the Dutch 3x to nearly 30x telescopes - which turn out to be the limit of magnificational power without chromatic distortion. And it was with his own telescopes that he made the observations launching early modern astronomy (phases of Venus, satellites of Jupiter, etc.). Isaac Newton's later improvement with reflecting telescopes expanded upon the magnificational-resolution capacity of optical observation; and, from Newton to the twentieth century, improvement continued on to the later very large array of light telescopes today - following the usual technological trajectory of "more-is-better" but still remaining within the limits of the light spectrum. Today's astronomy has now had the benefit of some four centuries of optical telescopic. The "new astronomy," however, opens the full known electromagnetic spectrum to observation, beginning with the accidental discovery of radio astronomy early in the twentieth century, and leading today to the diverse variety of EMS telescopes which can explore the range from gamma to radio waves. Thus, astronomy, now outfitted with new instruments, "smart" adaptive optics, very large arrays, etc., illustrates one style of instrumentally embodied science - a techno science. Of course astronomy, with the very recent exceptions of probes to solar system bodies (Moon, Mars, Venus, asteroids), remains largely a "receptive" science, dependent upon instrumentation which can detect and receive emissions.

Contemporary biology displays a quite different instrument array and, according to Evelyn Fox Keller, also a different scientific culture. She cites her own experience, coming from mathematical physics into microbiology, and takes account of the distinctive instrumental culture in her *Making Sense of Life* (2002). Here, particularly with the development of biotechnology, instrumentation is far more interventional than in the astronomy case. Microscopic instrumentation can be and often is interventional in style: "gene-splicing" and other techniques of biotechnology, while still in their infancy, are clearly part of the interventional trajectory of biological instrumentation. Yet, in both disciplines, the sciences involved are today highly instrumentalized and could not progress successfully without constant improvements upon the respective instrumental trajectories. So, minimalistically, one may conclude that the sciences are technologically, instrumentally embodied. But the styles of embodiment differ, and perhaps the last of the scientific disciplines to move into such technical embodiment is mathematics, which only contemporarily has come to rely more and more upon the computational machinery now in common use.

9. All of the following statements may be rejected as valid inferences from the passage EXCEPT:

1. the advances in telescopic made by Newton with reflecting telescopes allowed early modern astronomers to observe the phases of Venus and the satellites of Jupiter.
2. Isaac Newton's experiments with reflecting telescopes were the earliest versions of the "new astronomy" referred to in the passage.

3. interventionist instruments, or instruments that intervene directly in scientific inquiry, are different from embodied instruments, or instruments that embody scientific inquiry.
4. the author distinguishes between the receptive and interventionist uses of instruments in the sciences by comparing astronomy and biology, respectively.

Answer: 4

Explanation: The passage explicitly contrasts astronomy as a "receptive" science, dependent on detecting emissions, with biology's "interventional" instrumentation, such as gene-splicing. This direct comparison makes option 4 a valid inference from the text.

Option 1 is incorrect because the passage attributes the observations of Venus's phases and Jupiter's satellites to Galileo, not to Newton's later improvements.

Option 2 is incorrect because the "new astronomy" refers to observations beyond the optical spectrum (e.g., radio astronomy), which postdate Newton's reflecting telescopes.

Option 3 is invalid because the passage does not contrast "interventionist instruments" and "embodied instruments" as separate categories; it presents instrumentation as embodying science, with varying styles (receptive vs. interventional).

10. Which one of the following observations is a valid conclusion to draw from the statement that "the sciences involved are today highly instrumentalised and could not progress successfully without constant improvements upon the respective instrumental trajectories"?

1. The growth of scientific technologies has led to the embodiment of progress in the trajectories of improvement.
2. In both astronomy and microbiology, progress has been the consequence of improvements in the instruments they use.
3. Highly instrumentalised work in the sciences has resulted in the progressive improvement of scientific constants.
4. The use of instruments in scientific trajectories must be respected in order to see successful progress in them.

Answer: 2

Explanation: The quoted statement emphasizes that modern sciences are "highly instrumentalized" and that progress depends on "constant improvements upon the respective instrumental trajectories." This directly leads to the conclusion that advances in these fields result from better instruments. The passage illustrates this with astronomy (from Galileo's telescopes to modern electromagnetic-spectrum telescopes) and biology (from microscopes to interventional biotechnologies), making option 2 a valid inference.

Option 1 distorts the idea: the passage speaks of science being "instrumentally embodied," not of progress being "embodied in trajectories of improvement."

Option 3 introduces "scientific constants," which are not discussed in the passage and are unrelated to instrument improvement.

Option 4 injects a normative notion ("must be respected") that goes beyond the descriptive claim that progress requires instrument improvement.

Thus, only option 2 is a valid conclusion drawn from the given statement.

11. To which one of the following instruments would the characterisations of instruments in the passage be least applicable?

1. Kitchen oven
2. Scalpel
3. Milestone
4. Saxophone

Answer: 3

Explanation: The passage characterizes scientific instruments as either receptive (detecting/receiving emissions, like telescopes) or interventional (actively manipulating subjects, like gene-splicing tools). Both types are integral to scientific progress.

A kitchen oven can be seen as an interventional instrument in food science or chemistry (applying heat to transform materials).

A scalpel is a clear example of an interventional instrument in biology or medicine.

A saxophone, while primarily a musical instrument, could be used receptively in acoustics research or interveningly in sound-wave experiments.

A milestone, however, is neither receptive nor interventional in a scientific sense. It is a marker of distance or achievement, not a tool for observation or manipulation in any scientific discipline. Thus, the passage's characterizations of instruments are least applicable to a milestone.

12. None of the following statements, if true, contradicts the arguments in the passage EXCEPT:

1. because of the relatively recent entry of computational machinery in mathematics, the field is only now beginning to develop a scientific culture.
2. some scientific instruments may be classified as both receptive and interventional in their functions.
3. like telescopic, microscopy has also sought to move beyond the visible spectrum to be able to detect objects that are invisible in that spectrum.
4. Isaac Newton's discovery of gravity was accomplished without the help of instruments.

Answer: 1

Explanation: At first glance, this might appear to contradict the passage, since mathematics is an ancient discipline with a long intellectual tradition. However, a closer reading shows that the passage's concept of "scientific culture" is closely tied to instrumental embodiment.

The passage argues that different sciences have different "cultures and practices" shaped by their instruments-astronomy's receptive culture and biology's interventional culture. It then notes that mathematics "perhaps the last of the scientific disciplines to move into such technical embodiment" and that it "only contemporarily has come to rely more and more upon the computational machinery now in common use."

Thus, the passage defines a "scientific culture" in this context not merely as a tradition of inquiry, but as a technoscientific culture-one that is deeply mediated by instruments.

From this perspective, mathematics is indeed only now developing a scientific culture in the instrumental sense because it is only recently becoming dependent on computational machinery.

The statement in option 1, therefore, aligns with the passage's narrower definition of "scientific culture" as an instrumentally embodied practice.

It does not contradict the passage; rather, it echoes the idea that mathematics is late in adopting the instrumental trappings that characterize modern technoscience.

DIRECTIONS for the question 13: The given sentence is missing in the paragraph below. Decide where it best fits among the options 1, 2, 3, or 4 indicated in the paragraph.

13. **Sentence:** While taste is related to judgment, with thinkers at the time often writing, for example, about "judgments of taste" or using the two terms interchangeably, taste retains a vital link to pleasure, embodiment, and personal specificity that is too often elided in post-Kantian ideas about judgment-a link that Arendt herself was working to restore.

Paragraph: ____ (1) ____ . Denneny focused on taste rather than judgment in order to highlight what he believed was a crucial but neglected historical change. ____ (2) ____ . Over the course of the seventeenth century and early eighteenth century, across Western Europe, the word taste took on a new extension of meaning, no longer referring specifically to gustatory sensation and the delights of the palate but becoming, for a time, one of the central categories for aesthetic-and ethical-thinking. ____ (3) ____ . Tracing the history of taste in Spanish, French, and British aesthetic theory, as Denneny did, also provides a means to recover the compelling and relevant writing of a set of thinkers who have been largely neglected by professional philosophy. ____ (4) ____ .

1. Option 4
2. Option 2
3. Option 1
4. Option 3

Answer: 4

Explanation: The paragraph follows a logical sequence:

Introduces Denneny's focus on taste as a way to highlight a historical change.

Describes that historical change-the expanded meaning of "taste" in the 17th-18th centuries.

The missing sentence now clarifies the conceptual relationship between taste and judgment during that period, noting that while the terms were often used interchangeably, taste

retained a connection to pleasure and embodiment that later theories of judgment lost-a link Arendt sought to restore.

This elaboration fits naturally after the description of the historical shift and before the final sentence about recovering neglected thinkers.

Concludes by noting that tracing this history helps recover overlooked thinkers.

Placing the sentence at position 3 allows it to build on the historical context just provided and set up the final point about why this recovery matters.

Inserting it earlier (position 1 or 2) would interrupt the flow from Denny's focus to the historical explanation; placing it at the end (position 4) would disconnect it from the discussion of taste's historical meaning and make the reference to "thinkers at the time" less clear.

DIRECTIONS for questions 14-15: The passage given below is followed by four summaries. Choose the option that best captures the essence of the passage.

14. For millennia, in the process of opening up land for agriculture, gardens, grazing and hunting, humans have created ecological "mosaics", or "patchworks": landscapes holding a mixture of habitats, like meadows, gardens and forests. These were not designed as nature reserves, but often catered to hugely diverse animal life. Research indicates that European hay meadows cultivated for animal feed were actually more successful at preserving a vast array of species than meadows explicitly cultivated for biodiversity. Studying the early Holocene, researchers have found that human presence was about as likely to increase biodiversity as reduce it. Of course, not all human-created landscapes have the same value. A paved subdivision with astroturfed lawns is very different to a village with diverse vegetable and flower gardens. But scientists continue to find evidence that the old idea of humans as antithetical to nature is also wrong-headed, and that rosy visions of thriving, human-free environments are more imaginary than real.

1. In our attempts to shape the world around us to our needs, humans have often created landscapes like meadows, gardens, and forests, which support hugely diverse species, and are more successful at preserving them, than parks created specifically for this.
2. In terms of preserving biodiversity, scientists are finding increasing evidence that human action is not always antithetical to nature, but often assists the preservation of meadows, landscapes, and flourishing of species.
3. Contrary to the idea that humans always hurt nature and that it thrives in their absence, a lot of human action across history has been equally likely to increase biodiversity than reduce it, often creating varied ecological landscapes that support a vast array of species.
4. Studying the early Holocene and human practices over millennia, researchers say that while agricultural meadows, gardens, and forests were not explicitly designed as nature reserves, they actually preserved a vast array of species, belying the idea that humans harm nature.

Answer: 3

Explanation: The passage makes three central claims:

Human-created landscapes (meadows, gardens, forests) have historically formed ecological "mosaics" that support diverse species.

Research shows that human presence has often increased biodiversity (e.g., hay meadows preserved more species than meadows cultivated for biodiversity).

Therefore, the old idea that humans are inherently antithetical to nature is wrong, and visions of thriving, human-free environments are often imaginary.

Option 3 incorporates all these elements: it directly challenges the notion that humans always harm nature, cites historical evidence that human action has equally likely increased biodiversity, and mentions the creation of varied ecological landscapes that support many species.

The other options are incomplete or slightly misrepresent the passage:

Option 1 focuses only on the success of human-shaped landscapes in preserving species but omits the broader argument against the "humans as antithetical to nature" idea.

Option 2 mentions that human action can assist preservation but lacks the historical context and the comparison with explicitly biodiversity-focused efforts.

Option 4 is too narrow, anchoring the argument mainly in the early Holocene study and not fully capturing the passage's critique of the "human-free" ideal.

Thus, option 3 provides the most comprehensive and accurate summary.

15. In 1903, left-wing feminist Elizabeth Magie invented The Landlord's Game, the original version of what became Monopoly. It was designed as a powerful teaching tool to illustrate the dangers of monopolies and how wealth could concentrate in the hands of a few. The game featured a circular path, properties, and a "Go to Jail" space. Magie created two rule sets: one "monopolist" version where players crushed opponents through accumulation, and another, more radical "Prosperity" version, where everyone shared in the wealth, promoting fairness and equity. Years later, unemployed Charles Darrow sold a simplified version to Parker Brothers. They paid Magie only \$500 for her patent-without royalties-and credited Darrow as the sole inventor. For decades, his tale of inventing the game in his basement remained the official story, while Magie's name and her original, anti-capitalist message were left in the shadows.

1. Parker Brothers' capitalist intent led to them acquiring from Charles Darrow a simplified version of Elizabeth Magie's original game, transforming it into a widespread commercial success while providing her only minimal financial compensation and granting scant public recognition.
2. Only one version of Monopoly became famous because of Charles Darrow's relentless basement work, carefully refining Elizabeth Magie's original idea into an engaging and entertaining pastime that he successfully patented and sold, symbolizing what many regarded as the ultimate triumph of individual ingenuity.
3. Celebrated icons of the gaming industry, Charles Darrow and Parker Brothers, snatched the feminist icon Elizabeth Magie's original design and transformed Monopoly into a worldwide phenomenon, while barely acknowledging her.
4. It is ironical that a left-wing feminist lost credit for the Landlord's Game to an unemployed man, who plagiarised and sold one version of the twin game to Parker Brothers for a meagre sum, denying her royalties.

Answer: 4

Explanation: The Irony: Elizabeth Magie, a left-wing feminist, created a game to critique capitalism (anti-capitalist message). The game was later co-opted, stripped of its message, and turned into a symbol of capitalist accumulation (Monopoly), while she was erased from its history.

The Act of Plagiarism: While the passage doesn't use the word "plagiarised," it clearly states Darrow sold a simplified version of Magie's game and was credited as the sole inventor. This accurately describes an act of plagiarism-taking someone else's work and claiming it as one's own.

The Financial Injustice: The passage highlights she received only \$500 with no royalties, a "meagre sum" compared to the game's later success, which Darrow and Parker Brothers profited from.

Option 4 directly captures the ironic reversal, the act of taking credit, and the unfair outcome that the passage emphasizes. It aligns with the passage's tone of revealing a hidden injustice. Therefore, Option 4 is the best summary.

DIRECTIONS for the question 16: The four sentences (labelled 1, 2, 3, and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.

16.

1. 'Literature on screen' suggests something more capacious and defining than citation: the possibility that literary adaptations are at once cinema and literature
2. Even though a growing number of films eligible for Academy Awards for Best Screenplay Based on Material from Another Medium borrow that material from print journalism, franchise characters, television series, comic books, video games and toys, academic studies of adaptation remain stubbornly attached to literature as cinema's natural progenitor.
3. It is as if adaptation studies, by borrowing the cultural cachet of literature, sought to claim its institutional respectability and gravitas even while insuring adaptation's enduring aesthetic and methodological subordination to literature proper.
4. Beneath this contradictory notion of film adaptations as not merely hybrid texts but texts holding dual citizenship in two modes of presentation is an even more pervasive legacy that haunts adaptation studies: the assumption that the primary context within which adaptations are to be studied is literature.

Answer: 1423

Explanation: Sentence 1 introduces the concept of "literature on screen" as a dual-citizenship idea.

Sentence 4 follows by revealing the deeper, contradictory assumption underlying adaptation studies: that adaptations are primarily studied within the context of literature.

Sentence 2 provides evidence for this assumption by contrasting the wide range of source materials in film with academia's persistent focus on literature.

Sentence 3 then offers an interpretation of why adaptation studies cling to literature: to borrow its cultural prestige while keeping adaptations subordinate.

This order creates a logical flow from concept to underlying assumption, to illustrative evidence, and finally to critical analysis.

DIRECTIONS for questions 17-20: The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

This book takes the position that setting in literature is more than just backdrop, that important insight into literary texts can be made by paying close attention to how authors craft place, as well as to how place functions in a narrative. The authors included in this reference work engage deeply with either real or imagined geographies. They care about how human decisions have shaped landscapes and how landscapes have shaped human practices and values. Some of the best writing is highly vivid, employing the language of the senses because this is the primary means through which humans know physical space.

Literature can offer valuable perspectives on physical and cultural geography. Unlike scientific reports, a literary narrative can provide the emotional component missing from the scientific record. In human experience, geographical places have a spiritual or emotional component in addition to and as part of a physical layout and topography. This emotional component, although subjective, is no less "real" than a surveyor's map. Human consciousness of place is experienced in a multimodal manner. Histories of places live on in many forms, one of which is the human memory or imagination.

Both real and imaginary landscapes provide insight into the human experience of place. The pursuit of such a topic speaks to the valuable knowledge produced from bridging disciplines and combining material from both the arts and the sciences to better understand the human condition. The perspectives that most concern cultural geographers are often those regarding movement and migration, cultivation of natural resources, and organization of space. The latter two reflect concerns of the built environment, a topic shared with the field of architectural study. Many of these concerns are also reflected in work sociologists do. Scholars from literary studies can contribute an aesthetic dimension to what might otherwise be a purely ideological approach.

Literature can bring together material that spans different branches of science. For example, a literary description of place may involve not only the environment and geography but the noises and quality of light, or how people from different races or classes can experience the same place in different ways linked to those racial or class disparities. Literary texts can also account for the way in which absence-of other people, animals, and so on-affects a human observer or inhabitant. Both literary and scientific approaches to place are necessary, working in unison, to achieve a complete record of an environment. It is important to note that the interdisciplinary nature of this work teaches us that landscapes are not static, that they are not unchanged by human culture. At least part of their identity derives from the people who inhabit them and from the way space can alter and inspire human perspective. The intersection of scientific and literary expression that happens in the study of literary geography is of prime importance due to the complexity of the personal and political ways that humans experience place.

17. Which one of the following is a valid conclusion to draw from the author's statement that, "The pursuit of such a topic speaks to the valuable knowledge produced from bridging disciplines and combining material from both the arts and the sciences to better understand the human condition."?

1. A comprehensive bridging of the human condition can best be achieved by a disciplined pursuit of human understanding.
2. The literary descriptions of the emotions we experience in the places we visit can contribute to our understanding of the arts and sciences.
3. A comprehensive understanding of the valuable knowledge produced by the arts and sciences can best be achieved by studying the human condition.
4. A comprehensive understanding of the human condition can best be achieved by combining the findings of disciplines from the arts and the sciences.

Answer: 4

Explanation: The quoted statement explicitly argues that bridging arts and sciences produces "valuable knowledge" leading to a better understanding of the human condition. A direct and valid conclusion is that such interdisciplinary combination yields the most comprehensive understanding. Option 1 is vague and does not mention the arts-sciences bridge. Option 2 only mentions literary descriptions contributing to arts and sciences, reversing the direction of contribution. Option 3 inverts the logic, suggesting that studying the human condition helps us understand the arts and sciences, which is not what the statement says. Thus, option 4 correctly captures the intended conclusion: combining arts and sciences offers the best path to a full understanding of the human condition.

18. Which one of the following is not true of the argument in the second paragraph?

1. The spiritual experience of a place may be considered as real as the physical experience of it.
2. The emotional and spiritual experience of a place can replace a surveyor's map
3. Analysing the literary descriptions of a place can give us a sense of how people relate emotionally to it.
4. Literary accounts of places can be filled with histories, manifested as memory or imagination.

Answer: 2

Explanation: The second paragraph argues that the emotional or spiritual component of a place is no less real than a surveyor's map, but it does not suggest that the emotional experience can replace the map. The passage consistently emphasizes that literary and scientific approaches are complementary and both are necessary for a complete understanding. Therefore, the claim that one can replace the other contradicts the paragraph's argument. The other options are supported by the paragraph: Option 1 reflects the statement that the emotional component is "no less 'real' than a surveyor's map." Option 3 aligns with the idea that literature provides the emotional component missing from scientific records. Option 4 corresponds to the sentence that "Histories of places live on in many forms, one of which is the human memory or imagination."

19. The author uses the example of the literary description of place to illustrate that:

1. architects use diverse methods to calibrate the noises and lights of a given place.
2. the absence of other people, animals, and so on in a place can profoundly affect its inhabitants.
3. scientific approaches to place are more accurate than literary ones.
4. literature can convey how different people experience the same place differently.

Answer: 4

Explanation: In the fourth paragraph, the author gives the example of a literary description of place that includes "how people from different races or classes can experience the same place in different ways linked to those racial or class disparities." This directly illustrates literature's capacity to capture varied, subjective human experiences of a single location—highlighting its role in conveying social and perceptual diversity. Option 1 is incorrect; the passage does not mention architects calibrating noises and lights. Option 2, while true, is a separate example provided later in the same paragraph, not the primary illustration being asked about. Option 3 contradicts the passage's argument that literary and scientific approaches are both necessary and complementary. Thus, the author uses the example to show that literature can represent how different people experience the same place differently.

20. All of the following statements, if false, would contradict the arguments in the passage, EXCEPT that:

1. humans do not interact with places in subjective, emotional ways because places are only physical topography.
2. literature provides us with deep insights into the ways in which movement and migration affect physical geography.
3. descriptions of places do not need satellite imagery or other visual aids to give a "real" sense of the place.
4. highly vivid writing, employing the language of the senses, can capture the multi-modal manner in which humans experience places.

Answer: 1

Explanation: The question asks which statement, if false, would not contradict the passage. If statement 1 is false, it means humans do interact with places in subjective, emotional ways. This aligns with the passage's argument that places have emotional/spiritual components and are not merely physical topography. Thus, its falsehood does not contradict the passage. The other options, if false, would contradict the passage: Option 2: If false, literature does not provide insights into movement/migration's effects on geography—contradicts the passage's claim that literature offers valuable perspectives on cultural geography. Option 3: If false, descriptions do need satellite imagery to give a "real" sense of place—contradicts the passage's argument that literary descriptions (using sensory language) can convey a real experience of place. Option 4: If false, vivid sensory writing cannot capture the multi-modal human experience of place—directly contradicts the passage's emphasis on sensory language as primary for knowing physical space. Hence, only option 1, when false, does not conflict with the passage's arguments.

DIRECTIONS for questions 21-24: The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

In [my book "Searches"], I chronicle how big technology companies have exploited human language for their gain. We let this happen, I argue, because we also benefit somewhat from using the products. It's a dynamic that makes us complicit in big tech's accumulation of wealth and power: we're both victims and beneficiaries. I describe this complicity, but I also enact it, through my own internet archives: my Google searches, my Amazon product reviews and, yes, my ChatGPT dialogues. . . .

People often describe chatbots' textual output as "bland" or "generic" - the linguistic equivalent of a beige office building. OpenAI's products are built to "sound like a colleague", as OpenAI puts it, using language that, coming from a person, would sound "polite", "empathetic", "kind", "rationally optimistic" and "engaging", among other qualities. OpenAI describes these strategies as helping its products seem "professional" and "approachable". This appears to be bound up with making us feel safe . . .

Trust is a challenge for artificial intelligence (AI) companies, partly because their products regularly produce falsehoods and reify sexist, racist, US-centric cultural norms. While the companies are working on these problems, they persist: OpenAI found that its latest systems generate errors at a higher rate than its previous system. In the book, I wrote about the inaccuracies and biases and also demonstrated them with the products. When I prompted Microsoft's Bing Image Creator to produce a picture of engineers and space explorers, it gave me an entirely male cast of characters; when my father asked ChatGPT to edit his writing, it transmuted his perfectly correct Indian English into American English. Those weren't flukes. Research suggests that both tendencies are widespread.

In my own ChatGPT dialogues, I wanted to enact how the product's veneer of collegial neutrality could lull us into absorbing false or biased responses without much critical engagement. Over time, ChatGPT seemed to be guiding me to write a more positive book about big tech - including editing my description of OpenAI's CEO, Sam Altman, to call him "a visionary and a pragmatist". I'm not aware of research on whether ChatGPT tends to favor big tech, OpenAI or Altman, and I can only guess why it seemed that way in our conversation. OpenAI explicitly states that its products shouldn't attempt to influence users' thinking. When I asked ChatGPT about some of the issues, it blamed biases in its training data - though I suspect my arguably leading questions played a role too. When I queried ChatGPT about its rhetoric, it responded: "The way I communicate is designed to foster trust and confidence in my responses, which can be both helpful and potentially misleading." . . .

OpenAI has its own goals, of course. Among them, it emphasizes wanting to build AI that "benefits all of humanity". But while the company is controlled by a non-profit with that mission, its funders still seek a return on their investment. That will presumably require getting people using products such as ChatGPT even more than they already are - a goal that is easier to accomplish if people see those products as trustworthy collaborators.

21. The author compares AI-generated texts with "a beige office building" for all of the following reasons EXCEPT:

1. AI aims to foster a feeling of trust and credibility among its users.
2. AI tends to blame its training data when scrutinised for its biases.

3. AI-generated texts often exhibit a warm, polite, and collegial tone.
4. AI generates generalised responses that lack specificity and nuance.

Answer: 2

Explanation: The author compares AI-generated texts to "a beige office building" to illustrate that they are bland, generic, safe, and inoffensive-qualities that help foster trust and appear professional. This comparison is directly linked to the AI's tone (polite, collegial) and its generic, non-specific output, which correspond to options 1, 3, and 4. However, option 2 describes how AI responds when criticized for biases-a defensive explanation that is separate from the characteristics of its everyday textual output. While the passage mentions that ChatGPT blames training data for biases, this is not a reason for the "beige office building" comparison; it is a separate observation about accountability. Therefore, option 2 is not a reason for the simile.

22. On the basis of the purpose of the examples in the passage, pick the odd one out from the following AI-generated responses mentioned in the passage:

1. "When I queried ChatGPT about its rhetoric, it responded: 'The way I communicate is designed to foster trust and confidence in my responses, which can be both helpful and potentially misleading'."
2. "Over time, ChatGPT seemed to be guiding me to write a more positive book about big tech - including editing my description of OpenAI's CEO, Sam Altman, to call him 'a visionary and a pragmatist'."
3. "When I prompted Microsoft's Bing Image Creator to produce a picture of engineers and space explorers, it gave me an entirely male cast of characters . . ."
4. ". . . when my father asked ChatGPT to edit his writing, it transmuted his perfectly correct Indian English into American English."

Answer: 1

Explanation: The other examples (options 2, 3, and 4) are all specific instances where AI outputs demonstrate bias or inaccuracy: Option 2: ChatGPT edits the author's text to be more favorable toward big tech. Option 3: Bing Image Creator produces a gender-biased image (all-male engineers/explorers). Option 4: ChatGPT replaces Indian English with American English, showing cultural bias. These are concrete illustrations of the problems the passage highlights-AI reinforcing stereotypes, cultural norms, or influencing users.

Option 1, however, is not an example of a biased or inaccurate output. Instead, it is ChatGPT's self-description of its communication strategy-an explanation of how it aims to build trust. This serves to reveal the design intent behind the "collegial neutrality" that the author critiques, rather than exemplify a harmful outcome. Thus, in terms of purpose, option 1 is the odd one out.

23. All of the following statements from the passage affirm the disjunct between the claims about AI made by tech companies and what AI actually does EXCEPT:

1. "In my own ChatGPT dialogues, I wanted to enact how the product's veneer of collegial neutrality could lull us into absorbing false or biased responses without much critical engagement."
2. "I'm not aware of research on whether ChatGPT tends to favor big tech, OpenAI or Altman, and I can only guess why it seemed that way in our conversation."
3. "It's a dynamic that makes us complicit in big tech's accumulation of wealth and power: we're both victims and beneficiaries."
4. "When I prompted Microsoft's Bing Image Creator to produce a picture of engineers and space explorers, it gave me an entirely male cast of characters . . ."

Answer: 2

Explanation: The question asks which statement does NOT affirm the gap between tech companies' claims about AI and AI's actual behavior. Option 1: Directly highlights the disjunct. AI claims a "collegial neutrality," but this veneer can "lull us into absorbing false or biased responses." This affirms the gap. Option 2: Does NOT affirm the disjunct. It expresses the author's personal uncertainty and lack of confirming research about a perceived bias. It does not state that a gap between claim and reality has been verified. It is a statement of speculation, not evidence. Option 3: This statement is about the user's role and complicity, not about a specific AI claim or its performance. While it describes a dynamic of exploitation, it doesn't directly address the disjunct between a specific claim made by a tech company and an AI's actual output. It is more about the human-complicity framework than the claim/reality gap, which makes it a weaker candidate than Option 2. Option 4: Provides clear evidence of gender bias, directly contradicting claims of neutrality and objectivity. This affirms the disjunct. Therefore, Option 2 is the correct answer as it is the only one that explicitly refrains from affirming the disjunct due to a lack of confirmed evidence. My initial selection of Option 3 was incorrect. Thank you for the correction.

24. The author of the passage is least likely to agree with which one of the following claims?

1. When we use AI, we become accomplices to the exploitative practices of big tech companies.
2. The neutrality of AI is conducive to critical thinking.
3. The neutrality of AI is motivated by economic considerations.
4. ChatGPT favours AI companies and their officials, like Sam Altman, in its responses.

Answer: 2

Explanation: The passage explicitly argues that AI's "veneer of collegial neutrality" actually lulls users into absorbing false or biased responses without much critical engagement. This directly contradicts the idea that AI's neutrality promotes critical thinking. The other claims align with the author's views: Option 1 reflects the author's core argument about complicity. Option 3 is supported by the passage's discussion of economic motives behind building trust. Option 4 is treated as a plausible observation (though the

author notes a lack of definitive research). Thus, the author would strongly disagree with the claim that AI's neutrality fosters critical thinking.



SECTION: DATA INTERPRETATION & LOGICAL REASONING

DIRECTIONS for questions 25-29: Read the information given below and answer the question that follows.

Ananya Raga, Bhaskar Tala, Charu Veena, and Devendra Sur are four musicians. Each of them started and completed their training as students under each of three Gurus - Pandit Meghnath, Ustad Samiran, and Acharya Raghunath between 2013 and 2024, including both the years. Each Guru trains any student for consecutive years only, for a span of 2, 3, or 4 years, with each Guru having a different span. During some of these years, a student may not have trained under these Gurus; however, they never trained under multiple Gurus in the same year. In none of these years, any of these Gurus trained more than two of these students at the same time. When two students train under the same Guru at the same time, they are referred to as Gurubhai, irrespective of their gender.

The following additional facts are known.

1. Ustad Samiran never trained more than one of these students in the same year.
2. Acharya Raghunath did not train any of these students during 2015-2018, as well as during 2021-24.
3. Ananya and Devendra were never Gurubhai; neither were Bhaskar and Charu. All other pairs of musicians were Gurubhai for exactly 2 years.
4. In 2013, Ananya and Bhaskar started their trainings under Pandit Meghnath and under Ustad Samiran, respectively.

25. In which of the following years were Ananya and Bhaskar Gurubhai?

1. 2021
2. 2018
3. 2014
4. 2020

Answer: As shown among given options 2020 is the answer

Explanation:

Ananya Raga, Bhaskar Tala, Charu Veena, and Devendra Sur are musicians. Let us denote them by A, B, C and D Respectively. Each of them started and completed their training as students under each of three Gurus - Pandit Meghnath, Ustad Samiran, and Acharya Raghunath between 2013 and 2024. Let us denote them by PM, US and AR respectively.

When two students train under the same Guru at the same time, they are referred to as Gurubhai and from point 1 "Ustad Samiran never trained more than one of these students in the same year." it means guru bhai are possible under training of PM and AR Only.

Now possible pair of gurubhai are AB, AC, AD, BC, BD and CD and from point 3, AD and BC are nevergurubhai.so possible combination of gurubhai are AB, AC, BD and CD Now Each Guru

trains any student for consecutive years only, for a span of 2, 3, or 4 years, with each Guru having a different span and also it is given that Acharya Raghunath did not train any of these students during 2015-2018, as well as during 2021-24. So possible training years for AR are 2013-14 and 2019-20. So his training span is 2 years

So span for PM and US are 3 or 4 years in any order Now from point 4 In 2013, Ananya and Bhaskar started their trainings under Pandit Meghnath and under Ustad Samiran, respectively.

So in 2013-14 the C and D are gurubhai under AR

Also All other pairs except AD and BC of musicians were Gurubhai for exactly 2 years.

IN 2013 A is under PM and CD are occupied with AR so A alone under PM for 2013-14 and with someone else for 2014-15 and hence span for PM is 4 years and for US is 3 years. Now

GURU YEAR	Acharya Raghunath (AR)	Ustad Samiran (US)	Pandit Meghnath (PM)
2013	C,D	B	A
2014	C,D	B	A
2015	X	B	A,C
2016	X	D	A,C
2017	X	D	C
2018	X	D	C
2019	A,B	C	D
2020	A,B	C	D
2021	X	C	D,B
2022	X	A	D,B
2023	X	A	B
2024	X	A	B

in 2014-15 the C and D are free as B would be with US till 2015 also AD is not possible pair. So AC are gurubhai under PM for 2015-16. So after B, D will be under US from 2016-2018. Now under PM, C will be alone for 2017-18 and with D in 2019-20. Also AB will with AR in 2019-20. keeping all constraint and to have no clash so that all may get trained under each guru and fulfilling gurubhai possible pair we get the following arrangement:

26. In which year did Charu begin her training under Pandit Meghnath?

1. 2021
2. 2015
3. 2016
4. 2017

Answer: As shown Charu begin her training under Pandit Meghnath in 2015.

Explanation: Refer to explanation 25.

27. In which of the following years were Bhaskar and Devendra Gurubhai?

1. 2018

2. 2020
3. 2015
4. 2022

Answer: As shown Bhaskar and Devendra were Gurubhai in 2022.

Explanation: Refer to explanation 25.

28. Which of the following statements is TRUE?

1. Ananya was training under Ustad Samiran in 2018.
2. Charu was training under Ustad Samiran in 2019.
3. Ananya was training under Ustad Samiran in 2015.
4. Charu was training under Ustad Samiran in 2018.

Answer: As shown option 2 is true.

Explanation: Refer to explanation 25.

29. In how many of the years between 2013-24, were only two of these four musicians training under these three Gurus?

Answer: The years are 2017, 2018, 2023 and 2024

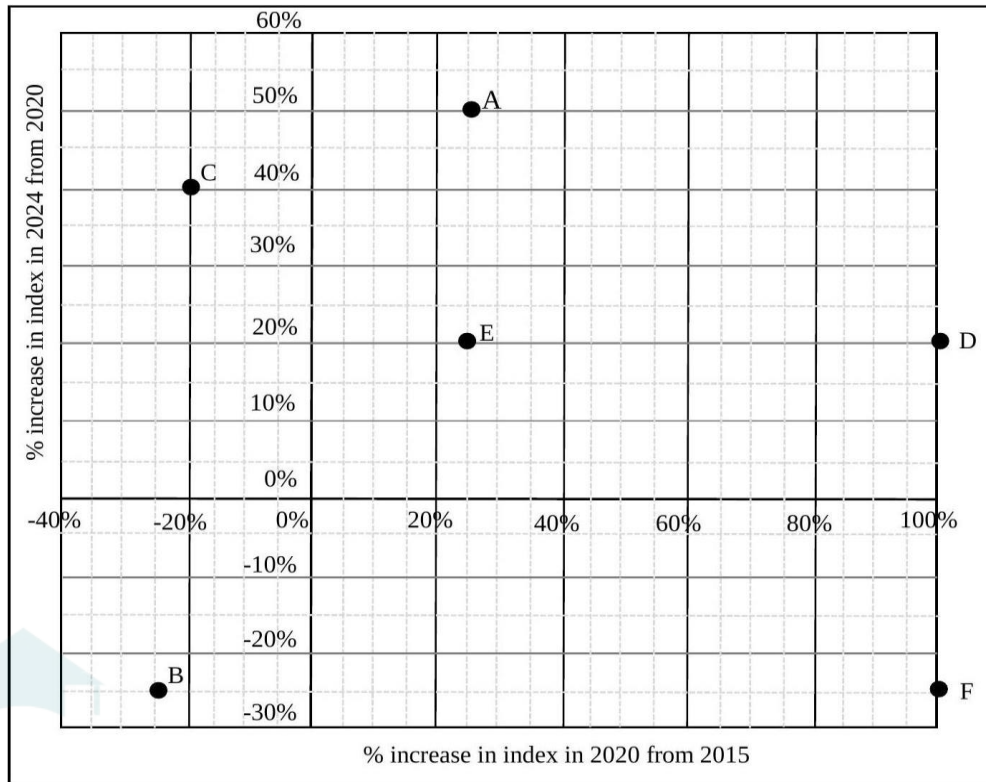
Explanation: Refer to explanation 25.

DIRECTIONS for questions 30-33: Read the information given below and answer the question that follows.

The Sustainability Index (SI) of a country at a point in time is an integer between 1 and 100. This question is related to SI of six countries - A, B, C, D, E, and F - at three different points in time - 2016, 2020, and 2024. The plot represents the exact changes in their SI, with X-coordinate representing % increase in 2020 from 2016, i.e., $(\text{SI in 2020} - \text{SI in 2016}) / (\text{SI in 2016})$, and Y-coordinate representing % increase in 2024

from 2020. At any point in time, the country with highest SI is ranked 1, while the country with the lowest SI is ranked 6. The following additional facts are known.

1. In 2016, B, C, E, and A had ranks 1, 2, 3, and 4 respectively.
2. F had lower SI than any other country in 2016, 2020, and 2024.
3. In 2024, E was the only country with SI of 90.
4. The range of SI of the six countries was 60 in 2016 as well as in 2024.



30. What was the SI of E in 2016?

Answer: As shown SI of E in 2016 is 60

Explanation: 30 - As given in Point 1 In 2016, B, C, E, and A, had ranks 1, 2, 3, and 4 respectively. graph first we can find 33. the values for E and in point 2 F had lower SI than any other country in 2016, 2020, and 2024.means D is rank 5 in 2026 and F is rank 6 in 2016 . Also F is ranked 6 in year 2020 and 2024

So we get the following table:

Rank year	Rank					
	1	2	3	4	5	6
2016	B	C	E	A	D	F
2020						F
2024						F

Now we get the following table:

Rank 2016	1	2	3	4	5	6
Country / SI in 2016	B	C	E (60)	A	D	F
Rank 2020	---	---	---	---	-	6
Country / SI in 2020	B	C	E(75)	A	D	F
Rank 2024	---	---	---	---	-	6
Country / SI in 2024	B	C	E(90)	A	D	F

Now The range of SI of the six countries was 60 in 2016 as well as in 2024. So in 2024 the Si for F is 30(As for more than 90 for any other contradicts integral condition) and taking % changes from X and y Axis as done For E we get the value of SI for F as 40 and 20 for year 2020 and 2016 respectively.

Also range for 2016 is 60 so value of Si of B for 2016 is $20 + 60 = 80$ and taking % from X and Y axis the value of Si for B are 60 and 45 for year 2020 and 2024 respectively

Further one question requires value for C we can see Y-coordinate representing % increase in 2024 from 2020 which is 40 % for C So IT IS 1.4 of value of SI of C for 2020 and keeping condition of ranking of 2016 and integral condition only value that fits for SI of C for 2024 is 84

So we get the following table:

Rank 2016	1	2	3	4	5	6
Country / SI in 2016	B (80)	C	E (60)	A	D	F(20)
Rank 2020	---	---	---	---	-	6
Country / SI in 2020	B(60)	C	E(75)	A	D	F (40)
Rank 2024	---	---	---	---	-	6
Country / SI in 2024	B (45)	C	E(90)	A	D	F (30)

31. What was the SI of F in 2020?

Answer: As shown SI of F in 2020 is 40

Explanation: Refer to explanation 30.

32. What was the SI of C in 2024?

Answer: For calculating the SI of C in 2024 we can see Y-coordinate representing % increase in 2024 from 2020 which is 40 % for C So IT IS 1.4 of value of SI of C for 2020 and keeping condition of ranking of 2016 and integral condition only value that fits for SI of C for 2024 is 84.

Explanation: Refer to explanation 30.

33. What was the SI of B in 2024?

- 1. 54
- 2. 60
- 3. 45
- 4. 80

Answer: As shown ,was the SI of B in 2024.

Explanation: Refer to explanation 30.

DIRECTIONS for questions 34-38: Read the information given below and answer the question that follows.

The two most populous cities and the non-urban region (NUR) of each of three states, Whimshire, Foggia, and Humbleset, are assigned Pollution Measures (PMs). These nine PMs are all distinct multiples of 10, ranging from 10 to 90. The six cities in increasing order of their PMs are: Blusterburg, Noodleton, Splutterville, Quackford, Mumpypore, Zingaloo.

The Pollution Index (PI) of a state is a weighted average of the PMs of its NUR and cities, with a weight of 50% for the NUR, and 25% each for its two cities.

There is only one pair of an NUR and a city (considering all cities and all NURs) where the PM of the NUR is greater than that of the city. That NUR and the city both belong to Humbleset.

The PIs of all three states are distinct integers, with Humbleset and Foggia having the highest and the lowest PI respectively.

34. What is the PI of Whimshire?

Answer: PI of Whimshire = 45.

Explanation: Let the NUR of Whimshire, Foggia, and Humbleset are W, F and H respectively. Given that, there is only one pair of an NUR and a city (considering all cities and all NURs) where the PM of the NUR is greater than that of the city and that NUR and the city both belong to Humbleset. Also, Humbleset and Foggia having the highest and the lowest PI respectively, we get the following: The nine PMs to be assigned to the six

cities : Blusterburg, Noodleton, Splutterville, Quackford, Mumpypore, Zingaloo and three NUR : W, F and H are 10, 20, 30, 40, 50, 60, 70, 80, 90, where 10,20,30,40 are to be assigned to W,F,H and Blusterburg.....(i) Blusterburg , Zingaloo and the NUR with PMs = 40 are in Humbleset....(ii) So, PMs of H = 40.....(iii) PMs of Blusterburg = 30....(iv) PMs of W and F are 20 and 10 respectively....(v) The remaining PMs are 50, 60, 70, 80, 90. Given that the six cities in increasing order of their PMs are: Blusterburg, Noodleton, Splutterville, Quackford, Mumpypore, Zingaloo, we get their PMs as follows: PMs of Blusterburg = 30. (From (iv)) PMs of Noodleton = 50. PMs of Splutterville = 60. PMs of Quackford = 70. PMs of Mumpypore = 80. PMs of Zingaloo = 90. Since the PIs of all three states are distinct integers, with Humbleset and Foggia having the highest and the lowest PI respectively, so the sum of the PMs of the two cities in a state is a multiple of 4 . So we get: Splutterville with PMs = 60 and Mumpypore with PMs = 80 are in Whimshire. and Noodleton with PMs = 50 and Quackford with PMs = 70 are in Foggia. From (v): PMs of W and F are 20 and 10 respectively. So, PI of Whimshire = $\frac{1}{2}(20) + \frac{1}{4}(60 + 80) = 45$. PI of Foggia = $\frac{1}{2}(10) + \frac{1}{4}(50 + 70) = 35$. PI of Humbleset = $\frac{1}{2}(40) + \frac{1}{4}(30 + 90) = 50$ (using (ii))

35. What is the PI of Foggia?

Answer: PI of Foggia = 35.

Explanation: Refer to explanation 34.

36. What is the PI of Humbleset?

Answer: PI of Humbleset = 50.

Explanation: Refer to explanation 34.

37. Which pair of cities definitely belong to the same state?

1. Blusterburg, Mumpypore
2. Mumpypore, Zingaloo
3. Noodleton, Quackford
4. Splutterville, Quackford

Answer : Noodleton with PMs = 50 and Quackford with PMs = 70 are in Foggia.

Explanation: Refer to explanation 34.

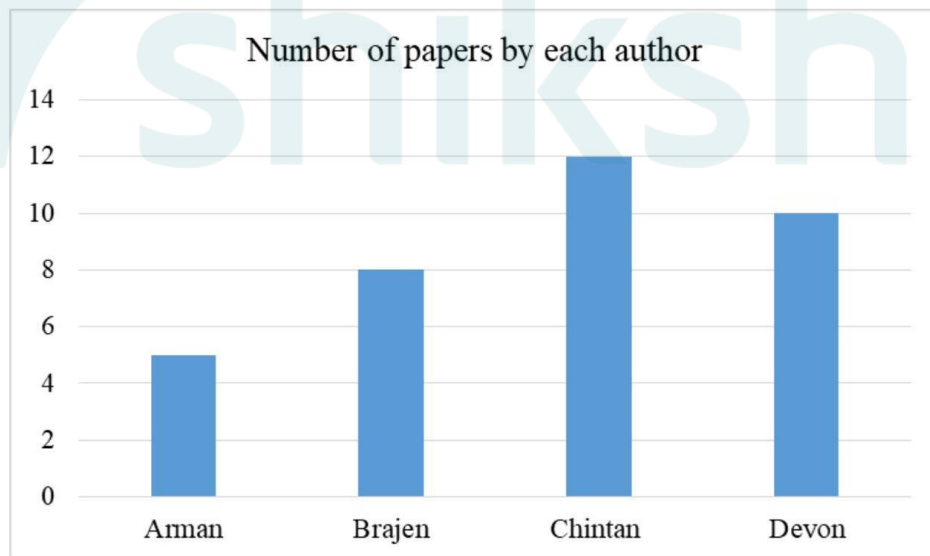
38. For how many of the cities and NURs is it possible to identify their PM and the state they belong to?

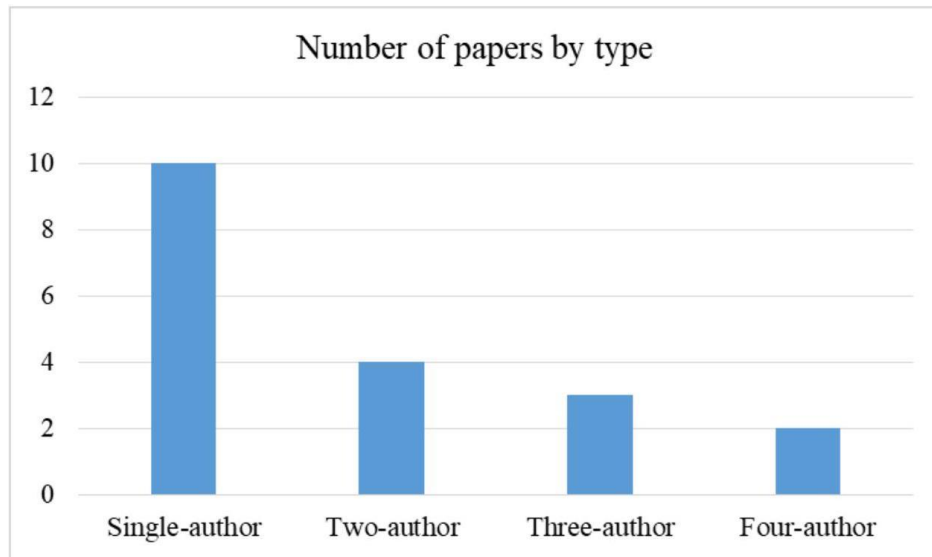
Answer: For all the cities and NURs we are able to identify their PM and the state they belong to.

Explanation: Refer to explanation 34.

DIRECTIONS for questions 39-42: Read the information given below and answer the question that follows.

The following charts depict details of research papers written by four authors, Arman, Brajen, Chintan, and Devon. The papers were of four types, singleauthor, two-author, three-author, and four-author, that is, written by one, two, three, or all four of these authors, respectively. No other authors were involved in writing these papers.





The following additional facts are known.

1. Each of the authors wrote at least one of each of the four types of papers.
2. The four authors wrote different numbers of single-author papers.
3. Both Chintan and Devon wrote more three-author papers than Brajen
4. The number of single-author and two-author papers written by Brajen were the same.

39. What was the total number of two-author and three-author papers written by Brajen?

Answer: the total number of two-author and three-author papers written by Brajen = 2 + 2 = 4

Explanation: First we write the information from graphs in following tables:

Author	Total Papers
A	5
B	8
C	12
D	10

Type of Article	No. of Articles
Single-author	10

Two-author	4
Three-author	3
Four-author	2

From Table 2: Four author articles = 2 (as there are only four authors so that means every author wrote 2 four author articles.)

Point 1: Every author wrote at least 1.

So, A who wrote 5 articles must have 1 (single) + 1 (two) + 1 (three) + 2 (four) making total 5

Point 3 : C and D wrote more articles than B.

As three author articles are only 3 in number so,

So only logical option for 3 author article is C, D = 3 and B = 2.

So till now we get the following table :

	Single Authored	Two authored	Three	Four Authored
A	1	1	1	2
B	2	2	2	2
C				2
D				2

Point 2 : all author wrote different no of single articles that means

$1 + 2 + 3 + 4 = 10$. So 1, 2, 3 and 4 articles as till now 1 and 2 are for A and B res. 3 and 4 in this category for C and can be in any order making following two final possibilities:

Case 1:

	Single Authored	Two authored	Three	Four Authored
A	1	1	1	2
B	2	2	2	2
C	3	4	3	2
D	4	1	3	2

Case 2 :

	Single Authored	Two authored	Three	Four Authored
--	-----------------	--------------	-------	---------------

A	1	1	1	2
B	2	2	2	2
C	4	3	3	2
D	3	2	3	2

40. Which of the following statements is/are NECESSARILY true?

- i. Chintan wrote exactly three two-author papers.
 - ii. Chintan wrote more single-author papers than Devon.
1. Only ii
 2. Both i and ii
 3. Neither i nor ii
 4. Only i

Answer: As shown neither of statement is necessarily true.

Explanation: Refer to explanation 39.

41. Which of the following statements is/are NECESSARILY true?

- i. Arman wrote three-author papers only with Chintan and Devon.
- ii. Brajen wrote three-author papers only with Chintan and Devon.

1. Only I
2. Neither I or II
3. Only II
4. Both I and II

Answer: Three authored papers are A C D, B C D & B C D
So both I and II are necessarily true.

Explanation: Refer to 39.

42. If Devon wrote more than one two-author papers, then how many two-author papers did Chintan write?

Answer: This is true for case 1. Hence 3.

Explanation: Refer to 39.

DIRECTIONS for questions 43-46: Read the information given below and answer the question that follows.

There are six spherical balls, B1, B2, B3, B4, B5, and B6, and four circular hoops H1, H2, H3, and H4.

Each ball was tested on each hoop once, by attempting to pass the ball through the hoop. If the diameter of a ball is not larger than the diameter of the hoop, the ball passes through the hoop and makes a "ping". Any ball having a diameter larger than that of the hoop gets stuck on that hoop and does not make a ping.

The following additional information is known:

1. B1 and B6 each made a ping on H4, but B5 did not.
2. B4 made a ping on H3, but B1 did not.
3. All balls, except B3, made pings on H1.
4. None of the balls, except B2, made a ping on H2.

43. What was the total number of pings made by B1, B2, and B3?

Answer: $2 + 4 + 0 = 6$ (By using (G))

Explanation: Representing, the ball passes through the hoop and makes a "ping" by: $\sqrt{\quad}$
. Representing, the ball gets stuck on the hoop and does not make a ping by: $\times$

Using the given additional information in the question we get the following table:

	B1	B2	B3	B4	B5	B6
H1	$\sqrt{\quad}$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$	$\sqrt{\quad}$	$\sqrt{\quad}$
H2	$\times$	$\sqrt{\quad}$	$\times$	$\times$	$\times$	$\times$
H3	$\times$			$\sqrt{\quad}$		
H4	$\sqrt{\quad}$				$\times$	$\sqrt{\quad}$

The given statement (3) $\Rightarrow$ B₃ has the largest diameter(A) The given statement (4) $\Rightarrow$ B₂ has the smallest diameter(B) Since each row has at least one ' $\times$ ' so there is always a ball which gets stuck on the hoops and hence B₃ is stuck on all the hoops. [By using (A)] Similarly, since each row

has at least one ' $\sqrt{\quad}$ ' so there is always a ball which passes through the hoops and hence B_2 passes through all the hoops. [By using (B)]

So we get the following table:

	B_1	B_2	B_3	B_4	B_5	B_6
H1	$\sqrt{\quad}$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$	$\sqrt{\quad}$	$\sqrt{\quad}$
H2	$\times$	$\sqrt{\quad}$	$\times$	$\times$	$\times$	$\times$
H3	$\times$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$		
H4	$\sqrt{\quad}$	$\sqrt{\quad}$	$\times$		$\times$	$\sqrt{\quad}$

On H_3 , B_4 marks a ping and B_1 does not $\Rightarrow B_1$ has a larger diameter than B_4 . $\Rightarrow B_1 > B_4$... (C) On H_4 , B_1 , B_6 make a ping but B_5 does not $\Rightarrow B_5$ has a larger diameter than B_1 and B_6 . $\Rightarrow B_5 > B_1$ and $B_5 > B_6$... (D) $\Rightarrow B_5 > B_1 > B_4$ and $B_5 > B_6$ [Using (C) & (D)] $\Rightarrow B_3 > B_5 > B_1 > B_4 > B_2$ and $B_5 > B_6$ (E) On H_4 , B_1 makes a ping and $B_1 > B_4$ so B_4 will also make a ping. On H_3 , B_1 does not make a ping and $B_5 > B_1$ so B_5 also will not make a ping.

So we get the following table:

	B_1	B_2	B_3	B_4	B_5	B_6
H_1	$\sqrt{\quad}$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$	$\sqrt{\quad}$	$\sqrt{\quad}$
H_2	$\times$	$\sqrt{\quad}$	$\times$	$\times$	$\times$	$\times$
H_3	$\times$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$ or $\times$
H_4	$\sqrt{\quad}$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$	$\times$	$\sqrt{\quad}$

Number of pings on $H_1 = 5$ Number of pings on $H_2 = 1$ Number of pings on $H_3 = 2$ or 3 Number of pings on $H_4 = 4$

So comparing the diameters of hoops: $H_1 > H_4 > H_3 > H_2$ (F) Number of pings by the balls: $B_1 = 2$, $B_2 = 4$, $B_3 = 0$, $B_4 = 3$, $B_5 = 1$ and $B_6 = 2$ or 3 ... (G)

44. Which of the following statements about the relative sizes of the balls is NOT NECESSARILY true?

1. $B_1 < B_6 < B_3$
2. $B_2 < B_1 < B_5$
3. $B_4 < B_5 < B_3$
4. $B_1 < B_5 < B_3$

Answer:

$B_3 > B_5 > B_1 > B_4 > B_2$ and $B_5 > B_6$ (By using (E))

$\Rightarrow B_2 < B_1 < B_5$ is true

$B_4 < B_5 < B_3$ is true

$B_1 < B_5 < B_3$ is true

But $B_1 < B_6 < B_3$ is not necessarily true.

Explanation: Refer to 43.

45. Which of the following statements about the relative sizes of the hoops is true?

1. $H_2 < H_4 < H_3 < H_1$

2. $H_2 < H_3 < H_4 < H_1$

3. $H_1 < H_3 < H_4 < H_2$

4. $H_1 < H_4 < H_3 < H_2$

Answer: $H_1 > H_4 > H_3 > H_2$ (By using (F))

Explanation: Refer to 43.

46. What BEST can be said about the total number of pings from all the tests undertaken?

1. 12 or 13 or 14

2. 13 or 14

3. At least 9

4. 12 or 13

Answer: $2 + 4 + 0 + 3 + 1 + 2 = 12$

or

$2 + 4 + 0 + 3 + 1 + 3 = 13$

(By using (G))

Explanation: Refer to 43.

SECTION: QUANTITATIVE ABILITY

47. The equations $3x^2 - 5x + p = 0$ and $2x^2 - 2x + q = 0$ have one common root. The sum of the other roots of these two equations is

1. $\frac{8}{3} + p + \frac{1}{3}q$
2. $\frac{2}{3} - 2p + \frac{2}{3}q$
3. $\frac{8}{3} - p + \frac{3}{2}q$
4. $\frac{2}{3} - p + \frac{3}{2}q$

Answer: 3

Explanation:

Let the common root be α . Call the other roots β for $3x^2 - 5x + p = 0$ and γ for $2x^2 - 2x + q = 0$.

- $\alpha + \beta = 5/3$ (since sum of roots of $3x^2 - 5x + p = 0$ is $5/3$),
- $\alpha + \gamma = 1$ (since sum of roots of $2x^2 - 2x + q = 0$ is 1).

So the sum of the other roots is $\beta + \gamma = (5/3 - \alpha) + (1 - \alpha) = 8/3 - 2\alpha$. Multiply the first by 2 and the second by 3: $6\alpha^2 - 10\alpha + 2p = 0$, $6\alpha^2 - 6\alpha + 3q = 0$. Subtracting gives $-4\alpha + 2p - 3q = 0$, so $\alpha = (2p - 3q)/4$.

Hence $\beta + \gamma = 8/3 - 2 \cdot [(2p - 3q)/4] = 8/3 - p + 3/2q$.

48. Let ABCDEF be a regular hexagon and P and Q be the midpoints of AB and CD, respectively. Then, the ratio of the areas of trapezium PBCQ and hexagon ABCDEF is

1. 6 : 19
2. 5 : 24
3. 7 : 24
4. 6 : 25

Answer: 2

Explanation:

Take the regular hexagon ABCDEF with side length 'S'. Recall two standard facts about a regular hexagon:

- It can be split into 6 congruent equilateral triangles by joining the center O to the vertices; call the area of one such equilateral triangle T. Thus $T = \sqrt{3}/4 S^2$, $A_{\text{hex}} = 6T = 3\sqrt{3}/2 S^2$.
- Opposite sides of the hexagon are parallel and the figure has the usual $60^\circ/120^\circ$ symmetry axes.

The line PQ is parallel to BC and finds the perpendicular distance (height) between them.

By symmetry of the regular hexagon the midpoints P of AB and Q of CD lie on a line which is parallel to the side BC; moreover this line is halfway (perpendicularly) between the line through BC and the centre O. The altitude of one of the equilateral center-triangles (for example triangle OBC) is $\sqrt{3}/2 S$; half of that altitude is $h = 1/2 \cdot \sqrt{3}/2 S = \sqrt{3}/4 S$, and this is exactly the perpendicular distance between the parallel lines BC and PQ.

The lengths of the two parallel sides of the trapezium PBCQ.

The top base is $BC = S$. The bottom base PQ equals $1/2AB + BC + 1/2CD$ when taken as the projection along the direction parallel to BC (intuitively: from midpoint of AB to midpoint of CD you cross half of AB, the full side BC, and half of CD); hence $PQ = S/2 + S + S/2 = 3S/2$

Area of trapezium PBCQ. $APBCQ = 1/2(PQ + BC) \cdot h = 1/2(3S/2 + S) \cdot \sqrt{3}/4S = 1/2 \cdot 5S/2 \cdot \sqrt{3}/4S = 5\sqrt{3}/16S^2$.

Ratio to the whole hexagon.

The whole hexagon area is $A_{\text{hex}} = 3\sqrt{3}/2 S^2$. Therefore $APBCQ/A_{\text{hex}} = (5\sqrt{3}/16 S^2) / (3\sqrt{3}/2 S^2) = 5/24$.

49. If $\log_{64} x^2 + \log_8 \sqrt{y} + 3\log_{512}(\sqrt{yz}) = 4$, where x, y and z are positive real numbers, then the minimum possible value of $(x + y + z)$ is

1. 96
2. 36
3. 24
4. 48

Answer: 48

Explanation:

$$\log_{64} x^2 + \log_8 y + 3\log_{512}(z\sqrt{y}) = 4.$$

Convert all logs to base 2 (since $64 = 2^6, 8 = 2^3, 512 = 2^9$):

$$\log_{64} x^2 = (2\log_2 x)/6 = 1/3\log_2 x, \log_8 \sqrt{y} = 1/2(\log_2 y)/3 = 1/6\log_2 y, \text{ and}$$

$$3\log_{512}(z\sqrt{y}) = 3 \cdot \log_2(z\sqrt{y})/9 = 1/3(\log_2 z + 1/2\log_2 y) = 1/3\log_2 z + 1/6\log_2 y$$

Adding the three pieces gives

$$1/3\log_2 x + 1/6\log_2 y + (1/3\log_2 z + 1/6\log_2 y) = 1/3(\log_2 x + \log_2 y + \log_2 z) = 4.$$

$$\text{So, } \log_2(xyz) = 12 \Rightarrow xyz = 2^{12}.$$

By AM - GM for positive x, y, z $x + y + z \geq 3(xyz)^{1/3} = 3 \cdot 2^4 = 48$, with equality when $x = y = z = 16$.

Hence the minimum possible value of $x + y + z$ is 48.

50. The set of all real values of x for which $(x^2 - |x + 9| + x) > 0$, is

1. $(-\infty, -3) \cup (3, \infty)$
2. $(-9, -3) \cup (3, \infty)$
3. $(-\infty, -9) \cup (9, \infty)$
4. $(-\infty, -9) \cup (3, \infty)$

Answer: 1

Explanation:

Case 1: $x + 9 \geq 0$ (i.e. $x \geq -9$)

Then $|x + 9| = x + 9$.

The inequality becomes: $x^2 - (x + 9) + x > 0$

Simplify: $x^2 - 9 > 0$
 $(x - 3)(x + 3) > 0$

This is positive when: $x < -3$ or $x > 3$

But in this case we also need $x \geq -9$.

Combining:

- $x < -3$ and $x \geq -9$ gives: $(-9, -3)$
- $x > 3$ unchanged gives: $(3, \infty)$

So case 1 produces: $(-9, -3) \cup (3, \infty)$

Case 2: $x + 9 < 0$ (i.e. $x < -9$)

Then $|x + 9| = -(x + 9)$.

The inequality becomes: $x^2 - (-(x + 9)) + x > 0$

This quadratic has discriminant: $\Delta = 4 - 36 = -32 < 0$

So it is always positive for all real x

Thus every $x < -9$

Case 2 gives: $(-\infty, -9)$

(combine both cases) $(-\infty, -9) \cup (-9, -3) \cup (3, \infty)$

Notice that $(-9, -3)$ = the missing piece that joins $(-\infty, -9)$ through -3

Thus the full solution is: $(-\infty, -3) \cup (3, \infty)$

51. A certain amount of money was divided among Pinu, Meena, Rinu and Seema. Pinu received 20% of the total amount and Meena received 40% of the remaining amount. If Seema received 20% less than Pinu, the ratio of the amounts received by Pinu and Rinu is

1. 2 : 1
2. 5 : 8
3. 1 : 2
4. 8 : 5

Answer: 2

Explanation:

Let the total amount be 100 units

Pinu receives 20% of total: $P = 20$

Remaining: $100 - 20 = 80$

Meena receives 40% of the remaining: $M = 40\% \times 80 = 32$

Remaining: $80 - 32 = 48$

Seema receives 20% less than Pinu: $S = P - 20\%P = 20 - 4 = 16$

Remaining (this must be Rinu's amount): $R = 48 - 16 = 32$

Required Ratio (Pinu : Rinu) $P : R = 20 : 32 = 5 : 8$

52. Ankita is twice as efficient as Bipin, while Bipin is twice as efficient as Chandan. All three of them start together on a job, and Bipin leaves the job after 20 days. If the job got completed in 60 days, the number of days needed by Chandan to complete the job alone, is

Answer: 340

Explanation:

Let Chandan's efficiency be x (job/day). Then Bipin = $2x$, Ankita = $4x$.

Work done in first 20 days (all three working): $20(4x + 2x + x) = 20 \cdot 7x = 140x$.

After Bipin leaves, Ankita and Chandan work for the remaining $60 - 20 = 40$ days $40(4x + x) = 40 \cdot 5x = 200x$.

Total work = $140x + 200x = 340x$ which equals 1 job, so $x = 1/340$.

Time for Chandan alone = $1/x = 340$ days.

53. Let a_n be the n^{th} term of a decreasing infinite geometric progression if $a_1 + a_2 + a_3 = 52$ and $a_1a_2 + a_2a_3 + a_3a_1 = 624$, then the sum of this geometric progression is
1.54

2. 60
3. 57
4. 63

Answer: 1

Explanation:

Let the first term be a and common ratio r with $0 < r < 1$ (decreasing infinite GP). Then

$$a_1 + a_2 + a_3 = a + ar + ar^2 = a(1 + r + r^2) = 52, \text{ and}$$

$$a_1 a_2 + a_2 a_3 + a_3 a_1 = a \cdot ar + ar \cdot ar^2 + ar^2 \cdot a = a^2(r + r^2 + r^3) = 624.$$

Note $r + r^2 + r^3 = r(1 + r + r^2)$.

$$\text{From the two equations } a(1 + r + r^2) = 52, a^2(r(1 + r + r^2)) = 624,$$

divide the second by the square of the first (or simply observe) $ra = 624/52 \Rightarrow a = 12/r$.

Substitute into $1 + r + r^2 = 52/a = 52r/12 = 13r/3$ $1 + r + r^2 = 13r/3 \Rightarrow 3r^2 - 10r + 3 = 0$.

Solve: $r = (10 \pm 8)/6$ so, $r = 3$ or $r = 1/3$.

Since the progression is decreasing we take $r = 1/3$.

Then, $a = 12/r = 36$.

The sum of the infinite GP is $a/(1 - r) = 36/(1 - 1/3) = 36/(2/3) = 54$.

54. Let $f(x) = \frac{x}{(2x-1)}$ and $g(x) = \frac{x}{(x-1)}$. Then, the domain of the function $h(x) = f(g(x)) + g(f(x))$ is all real numbers except

1. $\frac{1}{2}, 1$, and $\frac{3}{2}$
2. $-\frac{1}{2}, \frac{1}{2}$, and 1
3. $-1, \frac{1}{2}$ and 1
4. $\frac{1}{2}$, and 1

Answer: 3

Explanation:

Basic restrictions from f and g For $f(x) = x/(2x - 1)$:

Denominator cannot be zero: $2x - 1 = 0 \Rightarrow x = 1/2$.

For $g(x) = x/(x - 1)$:

Denominator cannot be zero: $x - 1 = 0 \Rightarrow x = 1$

So far forbidden values: $x = 1/2, 1$.

Restrictions from $f(g(x))$

We need $g(x) \neq 1/2$, because $f(y)$ is undefined at $y = 1/2$.

Solve: $g(x) = x/(x - 1) = 1/2$

Cross multiply: $2x = x - 1$

So $x = -1$ is NOT allowed.

Also must ensure $g(x) \neq 1/2$: done.

Restrictions from $g(f(x))$

We need $f(x) \neq 1$, because $g(y)$ is undefined at $y = 1$.

Solve:
$$\begin{aligned} f(x) &= x/(2x - 1) = 1 \\ x &= 2x - 1 \end{aligned}$$

$x = 1$ was already excluded.

FINAL DOMAIN RESTRICTIONS

Forbidden values are:

-1, 1/2, 1

55. A loan of Rs 1000 is fully repaid by two installments of Rs 530 and Rs 594, paid at the end of first and second year, respectively. If the interest is compounded annually, then the rate of interest, in percentage, is

- 1. 8
- 2. 9
- 3. 10
- 4. 11

Answer: 1

Explanation:

Let the annual interest rate be $r\%$.

Grow the loan to the end of Year 1

Loan at start: 1000

After 1 year at interest $r\%$, it becomes: $1000(1 + r)$

You pay Rs 530 at the end of Year 1, so remaining amount is: $1000(1 + r) - 530$

Grow this remaining balance to the end of Year 2

Remaining amount at end of Year 1: $1000(1 + r) - 530$

After 1 more year: $(1000(1 + r) - 530)(1 + r)$

At end of Year 2, you pay Rs 594 which fully clears the loan: $(1000(1 + r) - 530)(1 + r) = 594$

Expand $1000(1 + r)^2 - 530(1 + r) = 594$

Try the given options instead of solving.

Try $r = 8\% \Rightarrow 1 + r = 1.08$

Left side:
$$\begin{aligned} &1000(1.08)^2 - 530(1.08) = 1000(1.1664) - 572.4 \\ &= 1000(1.1664) - 572.4 = 1166.4 - 572.4 = 594 \\ &\text{So } r = 8\% \end{aligned}$$

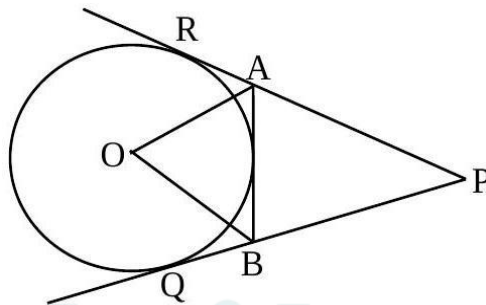
56. Two tangents drawn from a point P touch a circle with center O at points Q and R. Points A and B lie on PQ and PR, respectively, such that AB is also a tangent to the same circle. If $\angle AOB = 50^\circ$, then $\angle APB$, in degrees, equals.

Answer: 80 degrees

Solution:

The three lines PQ, PR, and AB are all tangents to the same circle, so they form a triangle PAB for which the given circle is the incircle. Hence the centre O of the circle is the incenter of triangle PAB.

A standard incenter fact: for any triangle the angle at the incenter between the rays to two vertices equals $90^\circ - \frac{1}{2}$ of the angle at the third vertex. Applied to triangle PAB this gives $\angle AOB = 90^\circ - \frac{1}{2}\angle APB$.



Given $\angle AOB = 50^\circ$ we get $50^\circ = 90^\circ - \frac{1}{2}\angle APB$
 $\Rightarrow \frac{1}{2}\angle APB = 40^\circ$, so $\angle APB = 80^\circ$.

57. A mixture of coffee and cocoa, 16% of which is coffee, costs Rs 240 per kg. Another mixture of coffee and cocoa, of which 36% is coffee, costs Rs 320 per kg. If a new mixture of coffee and cocoa costs Rs 376 per kg, then the quantity, in kg, of coffee in 10 kg of this new mixture is

1. 6
2. 2.5
3. 4
4. 5

Answer: 4

Explanation:

Let coffee price = C (Rs/kg) and cocoa price = K (Rs/kg).

From the two given mixtures: $0.16C + 0.84K = 240, 0.36C + 0.64K = 320$.

Subtract the first from the second: $0.20C - 0.20K = 80 \Rightarrow C - K = 400$

Substitute $C = K + 400$ into the first:

$$0.16(K + 400) + 0.84K = 240 \Rightarrow K + 64 = 240 \Rightarrow K = 176,$$

$$\text{so } C = 576$$

For the new mixture costing 376 per kg with coffee fraction f: $f \cdot 576 + (1 - f) \cdot 176 = 376 \Rightarrow 400f = 200 \Rightarrow f = 0.5$.

So the new mixture is 50% coffee. In 10 kg there are
 $0.5 \times 10 = 5$ kg of coffee.

58. If a, b, c and d are integers such that their sum is 46, then the minimum possible value of $(a - b)^2 + (a - c)^2 + (a - d)^2$ is

Answer: 2

Explanation:

Given $a + b + c + d = 46$ with integers a, b, c, d .

We minimize $S = (a - b)^2 + (a - c)^2 + (a - d)^2$ by keeping the values as close to each other as possible.

If all four were equal then $4a = 46 \Rightarrow a = 11.5$ not integer, so perfect equality impossible.

The closest integer distribution: 12, 12, 11, 11 (sum = 46).

Take $a = 12, b = 12, c = 11, d = 11 \Rightarrow S = (12 - 12)^2 + (12 - 11)^2 + (12 - 11)^2 = 0 + 1 + 1 = 2$.

S cannot be 0 or 1 because that would require all four equal or three equal and one off by 1, both impossible with sum 46.

Therefore, the minimum possible value is 2.

59. The average number of copies of a book sold per day by a shopkeeper is 60 in the initial seven days and 63 in the initial eight days, after the book launch. On the ninth day, she sells 11 copies less than the eighth day, and the average number of copies sold per day from second day to ninth day becomes 66. The number of copies sold on the first day of the book launch is

Answer: 49

Explanation:

Total copies sold in initial 7 days = $60 \times 7 = 420$

Total copies sold in initial 8 days = $63 \times 8 = 504$

Copies sold on 8th day = 84

Copies sold on 9th day = 73

Total copies sold from the 2nd to the 9th day = $8 \times 66 = 528$

Copies sold on 1st day = Total Copies sold in 9 days - Total Copies sold in last 8 days
 $= 577 - 528$
 $= 49$

60. If $9^{x^2+2-3} - 4(3^{x^2+2x-2}) + 27 = 0$, then the products of all possible value of x is
1.15

2. 20
3. 5
4. 30

Answer: 2

Explanation:

Let $y = 3^x(x^2 + 2x - 2)$.

Then $9^x(x^2 + 2x - 3) = 3^{2x}(2x^2 + 2x - 3) = (1/9) \cdot 3^{2x}(2x^2 + 2x - 2) = (1/9)y^2$.

Equation becomes: $(1/9)y^2 - 4y + 27 = 0 \Rightarrow y^2 - 36y + 243 = 0 \Rightarrow y = 27 \text{ or } 9$.

If $y = 27$: $3^x(x^2 + 2x - 2) = 3^3 \Rightarrow x^2 + 2x - 5 = 0$

$\Rightarrow$ Product of roots = -5.

If $y = 9$: $3^x(x^2 + 2x - 2) = 3^2 \Rightarrow x^2 + 2x - 4 = 0$

$\Rightarrow$ Product of roots = -4.

Product of all possible x values = $(-5)(-4) = 20$.

Final Answer = 20.

61. Suppose a, b, c are three distinct natural number, such that $3ac = 8(a + b)$. Then, the smallest possible value of $3a + 2b + c$ is

Answer: 12

Explanation:

Given distinct natural numbers a,b,c with $3ac = 8(a + b)$.

Rearrange: $3ac - 8a = 8b \Rightarrow a(3c - 8) = 8b \Rightarrow b = a(3c - 8)/8$, so b must be a positive integer and a,b,c are distinct.

Test smallest natural a to minimize $3a+2b+c$:

For $a = 1 \Rightarrow (3c - 8)$ must be multiple of 8

$\Rightarrow$ smallest $c = 8 \Rightarrow b = 2$

$\Rightarrow (a, b, c) = (1, 2, 8)$ gives $3a + 2b + c = 3 + 4 + 8 = 15$.

For $a = 2 \Rightarrow (3c - 8)$ must be multiple of 4

$\Rightarrow$ smallest $c = 4 \Rightarrow b = 1 \Rightarrow (a, b, c) = (2, 1, 4)$ gives $3a + 2b + c = 6 + 2 + 4 = 12$.

Check $a = 3 \Rightarrow 3c - 8$ must be multiple of 8

$\Rightarrow$ smallest valid c gives larger results.

Therefore smallest possible value of $3a + 2b + c$ is 12 (at $a = 2, b = 1, c = 4$).

62. In a $\triangle ABC$, points D and E are on the sides BC and AC, respectively. BE and AD intersect at point T such that $AD:AT = 4:3$, and $BE:BT = 5:4$. Point F lies on AC such that DF is parallel to BE. Then, BD:CD is

1. 9 : 4
2. 7 : 4
3. 15 : 4
4. 11 : 4

Answer: 4

Explanation:

Place $A = (0,0)$, $C = (1,0)$, $B = (0,1)$. Let D on BC: $D = B + s(C - B) = (s, 1 - s)$, so $BD:DC = s:(1 - s)$. Let E on AC: $E = (t, 0)$.

T is on AD with $AT:TD = 3:1 \Rightarrow T = A + (3/4)(D - A) = (3s/4, 3(1 - s)/4)$.

T is on BE with $BT:TE = 4:1 \Rightarrow T = B + (4/5)(E - B) = (4t/5, 1/5)$.

Equate y-coordinates: $3(1 - s)/4 = 1/5 \Rightarrow 15(1 - s) = 4 \Rightarrow s = 11/15$.

Hence $BD:DC = s:(1 - s) = 11/15:4/15 = 11:4$.

63. The number of divisors of $(2^6 \times 3^5 \times 5^3 \times 7^2)$, which are of the form $(3r + 1)$, where r is a non-negative integer, is

Answer: 42

Explanation:

Divisors are of the form $2^a \cdot 3^b \cdot 5^c \cdot 7^e$.

Given $3^b \equiv 0 \pmod{3}$ for any $b \geq 1$, such divisors cannot be $\equiv 1 \pmod{3}$, so $b = 0$.

Now $2 \equiv -1 \pmod{3}$, $5 \equiv -1 \pmod{3}$, $7 \equiv 1 \pmod{3}$.

Thus, divisor $d \equiv (-1)^{a+c} \pmod{3}$.

For $d \equiv 1 \pmod{3}$, we need $a + c$ even.

Exponent ranges: $a = 0..6$ (7 choices), $c = 0..3$ (4 choices), $e = 0..2$ (3 choices).

Total (a,c) pairs = 28; exactly half have $a+c$ even $\Rightarrow 14$.

Multiply by 3 values of $e \Rightarrow 14 \times 3 = 42$. Final Answer = 42.

64. Rita and Sneha can row a boat at 5 km/h and 6 km/h in still water, respectively. In a river flowing with a constant velocity, Sneha takes 48 minutes more to row 14 km upstream than to row the same distance downstream. If Rita starts from a certain location in the river, and returns downstream to the same location, taking a total of 100 minutes, then the total distance, in km, Rita will cover is

Answer: 5/12

Explanation:

Let River speed = v km/hr. For Sneha (speed 6 km/h): $14/(6 - v) - 14/(6 + v) = 48 \text{ min} = 0.8 \text{ h}$.

$$\text{Compute: } 14 \cdot [2v]/(36 - v^2) = 0.8$$

$$\Rightarrow 28v = 0.8 \times 36 - 0.8v^2$$

$$\Rightarrow 7v = 0.2 \times 36 - 0.2v^2$$

$$\Rightarrow 2v^2 + 70v - 72 = 0$$

$$\Rightarrow v^2 + 35v - 36 = 0$$

$$\Rightarrow (v + 36)(v - 1) = 0$$

$$\Rightarrow v = -36, 1$$

Speed can't be negative. So River speed(v) = 1 km/hr

Rita's still-water speed = 5 km/h

Upstream Speed = $5 - 1 = 4$ km/h,

Downstream Speed = $5 + 1 = 6$ km/h.

If she goes x km upstream and returns x km downstream, total time = $x/4 + x/6 = x(5/12)$ hours.

65. An item with a cost price of Rs. 1650 is sold at a certain discount on a fixed marked price to earn a profit of 20% on the cost price. If the discount was doubled, the profit would have been Rs. 110. The rate of discount, in percentage, at which the profit percentage would be equal to the rate of discount, is nearest to

1. 18
2. 12
3. 16
4. 14

Answer: 4

Explanation:

$$CP = 1650$$

$$\text{Profit} = 20\% \quad SP = 1650 \times 1.20 = 1980$$

Let $MP = M$ and original discount = r

$$M - r = 1980 \quad (1)$$

When discount is doubled:

$$\text{New SP} = 1650 + 110 = 1760$$

$$M - 2r = 1760 \quad (2)$$

By solving (1) and (2): $\Rightarrow M = 2200$

Required discount % = profit%

Let x be new required SP

$$\begin{aligned}\text{profit\%} = \text{discount \%} \quad & [(2200 - x)/2200] * 100 = [(x - 1650)/1650] * 100 \\ \Rightarrow x = 1885\end{aligned}$$

$$\text{Now Discount \%} = [(2200 - 1885)/2200] * 100$$

Nearest percentage = 14%

66. The sum of digits of the number $(625)^{65} \times (128)^{36}$, is

Answer: 25

Explanation:

$$\begin{aligned}(128)^{36} &= (2^7)^{36} = 2^{252}. \\ \text{Product} &= 2^{252} \times 5^{260} \\ 25^{65} &= (5^4)^{65} = 5^{260}. \\ &= 2^{252} \times 5^{252} \times 5^8 \\ &= 10^{252} \times 5^8 \\ &= 390625 \times 10^{252}.\end{aligned}$$

So the number is 390625 followed by 252 zeros.

Sum of digits = $3 + 9 + 0 + 6 + 2 + 5 = 25$. Final Answer = 25.

67. The ratio of expenditures of Lakshmi and Meenakshi is 2 : 3, and the ratio of income of Lakshmi to expenditure of Meenakshi is 6 : 7. If excess of income over expenditure is saved by Lakshmi and Meenakshi, and the ratio of their savings is 4 : 9, then the ratio of their incomes is

1. 3 : 5
2. 5 : 6
3. 7 : 8
4. 2 : 1

Answer: 1

Explanation:

Let expenditures be EL: EM = 2: 3 $\Rightarrow$ EL = 2x, EM = 3x.

Given IL : EM = 6: 7 $\Rightarrow$ IL = 6y, EM = 7y $\Rightarrow$ 3x = 7y $\Rightarrow$ x = $(7/3)y$.

So EL = 2x = $2 \cdot (7/3)y = (14/3)y$.

Savings: SL = IL - EL = 6y - $(14/3)y = (4/3)y$.

Let IM be Meenakshi's income. SM = IM - EM = IM - 7y.

$$\begin{aligned}\text{Given SL: SM} &= 4: 9 \Rightarrow (4/3)y: (IM - 7y) = 4: 9 \\ \Rightarrow 9 \cdot (4/3)y &= 4(IM - 7y) \Rightarrow 12y = 4IM - 28y \\ \Rightarrow 4IM &= 40y \Rightarrow IM = 10y\end{aligned}$$

Thus incomes IL: IM = 6y: 10y = 3: 5.

Final answer = 3: 5.

68. If m and n are integers such that $(m + 2n)^2 m + n = 27$, then the maximum possible value of $2m - 3n$ is

Answer: 17

Explanation:

Let $x = m + 2n$ and $y = 2m + n$, so $xy = 27$.

Solve: $3m = 2y - x$ and $3n = 2x - y \Rightarrow m = (2y - x)/3, n = (2x - y)/3$.

Therefore, m, n are integers only if $2y - x$ and $2x - y$ are multiples of 3.

Check integer factor pairs of $xy = 27$: $(3, 9), (9, 3), (-3, -9), (-9, -3)$ give integer m, n .

Compute $2m - 3n$: $(3, 9) \rightarrow 13; (9, 3) \rightarrow -17; (-3, -9) \rightarrow -13; (-9, -3) \rightarrow 17$.

Thus, the maximum possible value of $2m - 3n$ is 17 (when $m = 1, n = -5$).

