SAT 2024 Practice Test 2 Question paper with solutions

Time Allowed :2 hours and 14 minutes	Maximum Marks :1600	Total Questions :98

General Instructions

GENERAL DIRECTIONS

1. You may work on only one module at a time.
2. If you finish a module before time is called, check your work on that module only. You may NOT turn to any other module.

TIMING

1. Reading and Writing, Module 1: 39 minutes
2. Reading and Writing, Module 2: 39 minutes
3. 10-minute break
4. Math, Module 1: 43 minutes
5. Math, Module 2: 43 minutes
6. The above are standard times. If you are approved for accommodations involving additional time, you should give yourself that time when you practice.

MARKING YOUR ANSWERS

1. Be sure to answer your questions properly in this book.
2. Circle only one answer to each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

USING YOUR TEST BOOK

1. You may use the test book for scratch work.
2. You may not fold or remove pages or portions of a page from this book, or take the book from the testing room.

Reading and Writing

(Module 1)

Directions :

The questions in this section address a number of important reading and writing skills. Each question includes one or more passages, which may include a table or graph. Read each passage and question carefully, and then choose the best answer to the question based on the passage(s). All questions in this section are multiple-choice with four answer choices. Each question has a single best answer.

1. As Mexico's first president from an Indigenous community, Benito Juarez became one of the most ____ figures in his country's history: among the many significant accomplishments of his long tenure in office (1858-1872), Juarez consolidated the authority of the national government and advanced the rights of Indigenous peoples.

(A) unpredictable

(B) important

(C) secretive

(D) ordinary

Correct Answer: (B) important

Solution:

In this sentence, the phrase "one of the most ____ figures" suggests that the word should highlight the significance of Benito Juarez. "Important" fits the context best, as it aligns with the idea of his major accomplishments. The other options do not fit the meaning of the sentence.

Quick Tip

When reading sentences with blank spaces, focus on the context of the text to determine the most fitting word choice.

2. Due to their often strange images, highly experimental syntax, and opaque subject matter, many of John Ashbery's poems can be quite difficult to ____ and thus are the object of heated debate among scholars.

(A) delegate

(B) compose

(C) interpret

(D) renounce

Correct Answer: (C) interpret

Solution:

The phrase "difficult to ____" implies that the word should relate to understanding or making sense of something. "Interpret" fits perfectly in this context as it refers to analyzing and understanding complex works. The other options do not logically fit with the context of understanding poetry.

Quick Tip

Pay attention to the context of the sentence when choosing words that relate to analysis or understanding.

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3. The Cambrian explosion gets its name from the sudden appearance and rapid diversification of animal animals in the fossil record about 541 million years ago, during the Cambrian period. Some scientists argue that this ____ change in the fossil record might be because of a shift in many organisms to body types that were more likely to be preserved.

(A) catastrophic

(B) elusive

(C) abrupt

(D) imminent

Correct Answer: (C) abrupt

Solution:

The phrase "rapid diversification" indicates a quick or sudden change, making "abrupt" the most fitting word. "Catastrophic" might suggest disaster but doesn't fit the context of a sudden evolutionary change.

Quick Tip

When analyzing a passage, look for words that suggest timing, speed, or change to select the most fitting word.

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4. During a 2014 archaeological dig in Spain, Vicente Lull and his team uncovered the skeleton of a woman from El Algar, an Early Bronze Age society, buried with valuable objects signaling a high position of power. This finding may persuade researchers who have argued that Bronze Age societies were ruled by men to ____ that women may have also held leadership roles.

(A) waive

(B) concede

(C) refute

(D) require

Correct Answer: (B) concede

Solution:

"Concede" is the correct word as it suggests reluctantly admitting something previously disputed or denied. "Waive," "refute," and "require" do not fit in the context of admitting new

evidence.

Quick Tip

When reading historical passages, pay attention to words that imply changing perspectives based on new evidence.

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5. Within baleen whale species, some individuals develop an accessory spleen—a seemingly functionless formation of splenetic tissue outside the normal spleen. Given the formation's greater prevalence among whales known to make deeper dives, some researchers hypothesize that its role isn't ____ ; rather, the accessory spleen may actively support diving mechanisms.

(A) replicable

(B) predetermined

(C) operative

(D) latent

Correct Answer: (C) operative

Solution:

"Operative" fits the context, as it refers to something that is actively working or serving a function. The context implies that the accessory spleen is not "inactive" or "latent," but plays an active role.

Quick Tip

When considering function in biological contexts, focus on terms that suggest active roles or mechanisms.

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6. According to a US tax policy expert, state taxes are ____ other factors when

considering an interstate move. Even significant differences in state taxation have almost no effect on most people's decisions, while differences in employment opportunities, housing availability, and climate are strong influences.

(A) consistent with

(B) representative of

(C) overshadowed by

(D) irrelevant to

Correct Answer: (C) overshadowed by

Solution:

"Overshadowed by" fits best, indicating that state taxes are less important than other factors. The other options do not convey this comparison effectively.

Quick Tip

Pay attention to phrases that show contrast or comparison when choosing words that suggest less importance.

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7. The author's claim about the relationship between Neanderthals and Homo sapiens is ____ as it fails to account for several recent archaeological discoveries. To be convincing, his argument would need to address recent finds of additional hominid fossils, such as the latest Denisovan specimens and Homo longi.

(A) disorienting

(B) tenuous

(C) nuanced

(D) unoriginal

Correct Answer: (B) tenuous

Solution:

"Tenuous" suggests that the author's claim is weak or not well-supported, which aligns with the argument that the claim fails to account for recent discoveries. "Disorienting" would imply confusion, which is not the case here. "Nuanced" implies subtlety, and "unoriginal" doesn't fit the context.

Quick Tip

Look for words that describe the strength or weakness of an argument when evaluating claims based on evidence.

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8. The following text is from Georgia Douglas Johnson's 1922 poem "Benediction."

Go forth, my son,
Winged by my heart's desire!
Great reaches, yet unknown,
Await
For your possession.
I may not, if I would,
Retrace the way with you,
My pilgrimage is through,
But life is calling you!

(A) To express hope that a child will have the same accomplishments as his parent did
(B) To suggest that raising a child involves many struggles
(C) To warn a child that he will face many challenges throughout his life
(D) To encourage a child to embrace the experiences life will offer

Correct Answer: (D) To encourage a child to embrace the experiences life will offer

Solution:

The poem encourages the child to move forward in life, symbolized by "life is calling you," implying the acceptance of life's experiences. The other options either misinterpret the message or focus on a specific struggle or challenge not mentioned.

Quick Tip

When analyzing a poem, focus on the tone and imagery to understand the message being conveyed.

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9. The following text is adapted from Indian Boyhood, a 1902 memoir by Ohiyesa (Charles A. Eastman), a Santee Dakota writer. In the text, Ohiyesa recalls how the women in his tribe harvested maple syrup during his childhood.

Now the women began to test the trees—moving leisurely among them, axe in hand, and striking a single quick blow, to see if the sap would appear. The trees, like people, have their individual characters; some were ready to yield up their life-blood, while others were more reluctant. Now one of the birchen basins was set under each tree, and a hardwood chip driven deep into the cut which the axe had made. From the corners of this chip—at first drop by drop, then more freely—the sap trickled into the little dishes.

(A) It portrays the range of personality traits displayed by the women as they work.
(B) It foregrounds the beneficial relationship between humans and maple trees.
(C) It demonstrates how human behavior can be influenced by the natural environment.
(D) It elaborates on an aspect of the maple trees that the women evaluate.

Correct Answer: (A) It portrays the range of personality traits displayed by the women as they work.

Solution:

The text highlights how the women interact with the trees, emphasizing their different "individual characters." This suggests a portrayal of varied personality traits among the women as they harvest the sap. The other options do not match the focus of the text on the women's

actions.

Quick Tip

Look for descriptions of actions that reveal character traits when analyzing texts focused on personal interaction with nature.

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10. Text 1

Ecologists have long wondered how thousands of microscopic phytoplankton species can live together near ocean surfaces competing for the same resources. According to conventional wisdom, one species should emerge after outcompeting the rest. So why do so many species remain? Ecologists' many efforts to explain this phenomenon still haven't uncovered a satisfactory explanation.

Text 2

Ecologist Michael Behenfeld and colleagues have connected phytoplankton's diversity to their microscopic size. Because these organisms are so tiny, they are spaced relatively far apart from each other in ocean water and, moreover, experience that water as a relatively dense substance. This in turn makes it hard for them to move around and interact with one another. Therefore, says Behenfeld's team, direct competition among phytoplankton probably happens much less than previously thought.

Based on the texts, how would Behenfeld and colleagues (Text 2) most likely respond to the "conventional wisdom" discussed in Text 1?

(A) By arguing that it is based on a misconception about phytoplankton species competing with one another
(B) By asserting that it fails to recognize that routine replenishment of ocean nutrients prevents competition between phytoplankton species
(C) By suggesting that their own findings help clarify how phytoplankton species are able to compete with larger organisms

(D) By recommending that more ecologists focus their research on how competition among phytoplankton species is increased with water density

Correct Answer: (A) By arguing that it is based on a misconception about phytoplankton species competing with one another

Solution:

The argument in Text 2 focuses on the idea that competition among phytoplankton is less likely than previously thought because of their small size and the physical properties of the water, which suggests that conventional wisdom in Text 1 may be mistaken.

Quick Tip

When analyzing scientific claims, pay attention to how new evidence might contradict or reinterpret earlier assumptions.

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11. In 2014, Amelia Quon and her team at NASA set out to build a helicopter capable of flying on Mars.

Because Mars's atmosphere is only one percent as dense as Earth's, the air of Mars would not provide enough resistance for the rotating blades of a standard helicopter for the aircraft to stay aloft. For five years, Quon's team tested designs in a lab that mimicked Mars's atmospheric conditions. The craft the team ultimately designed can fly on Mars because its blades are longer and rotate faster than those of a helicopter of the same size built for Earth.

According to the text, why would a helicopter built for Earth be unable to fly on Mars?

(A) Because Mars and Earth have different atmospheric conditions
(B) Because the blades of helicopters built for Earth are too large to work on Mars
(C) Because the gravity of Mars is much weaker than the gravity of Earth
(D) Because helicopters built for Earth are too small to handle the conditions on Mars

Correct Answer: (A) Because Mars and Earth have different atmospheric conditions

Solution:

The text explains that Mars's atmosphere is much thinner than Earth's, so a standard helicopter built for Earth would not be able to generate enough lift. The difference in atmospheric conditions is the key factor that prevents Earth-based helicopters from flying on Mars.

Quick Tip

When evaluating scientific or technical claims, always look for key details that explain why certain conditions or factors prevent a process from working as expected.

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12. In West Africa, jails have traditionally been keepers of information about family histories and records of important events. They have often served as teachers and advisers, too. New technologies may have changed some aspects of the role today, but jails continue to be valued for knowing and protecting their people's stories.

Which choice best states the main idea of the text?

(A) Even though there have been some changes in their role, jails continue to preserve their communities' histories.
(B) Although jails have many roles, many of them like teaching best.
(C) Jails have been entertaining the people within their communities for centuries.
(D) Technology can now do some of the things jails used to be responsible for.

Correct Answer: (A) Even though there have been some changes in their role, jails continue to preserve their communities' histories.

Solution:

The text emphasizes that while there have been changes due to technology, jails continue to

serve as vital keepers of information about family histories and important events.

Quick Tip

When summarizing a text, focus on the core theme that ties all the details together.

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13. In 1934 physicist Eugene Wigner posited the existence of a crystal consisting entirely of electrons in a honeycomb-like structure. The so-called Wigner crystal remained largely conjecture, however, until Feng Wang and colleagues announced in 2021 that they had captured an image of one. The researchers trapped electrons between two semiconductors and then cooled the apparatus, causing the electrons to settle into a crystalline structure. By inserting an ultrathin sheet of graphene above the crystal, the researchers obtained an impression—the first visual confirmation of the Wigner crystal.

Which choice best states the main idea of the text?

(A) Researchers have obtained the most definitive evidence to date of the existence of the Wigner crystal.
(B) Researchers have identified an innovative new method for working with unusual crystalline structures.
(C) Graphene is the most important of the components required to capture an image of a Wigner crystal.
(D) It's difficult to acquire an image of a Wigner crystal because of the crystal's honeycomb structure.

Correct Answer: (A) Researchers have obtained the most definitive evidence to date of the existence of the Wigner crystal.

Solution:

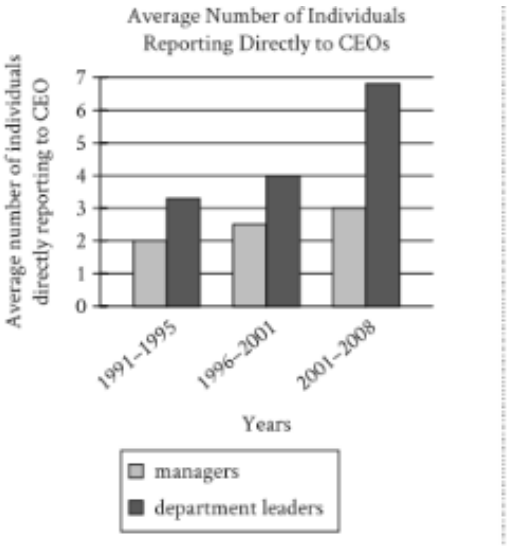
The text discusses the breakthrough discovery of the Wigner crystal, making (A) the best sum-

mary, as it highlights the definitive evidence obtained. The other options either overemphasize specific details or miss the main point of the discovery.

Quick Tip

Focus on the key achievement described in the text when identifying the main idea.

14.



Considering a large sample of companies, economics experts Maria Guadalupe, Julie Wulf, and Raghuram Rajan assessed the number of managers and leaders from different departments who reported directly to a chief executive officer (CEO). According to the researchers, the findings suggest that across the years analyzed, there was a growing interest among CEOs in connecting with more departments in their companies.

Which choice best describes data from the graph that support the researchers' conclusion?

(A) The average numbers of managers and department leaders reporting directly to their CEO didn't fluctuate from the 1991-1995 period to the 2001-2008 period.

(B) The average number of managers reporting directly to their CEO was highest in the 1996-2001 period.

(C) The average number of department leaders reporting directly to their CEO was greater

than the average number of managers reporting directly to their CEO in each of the three periods studied.
(D) The average number of department leaders reporting directly to their CEO rose over the three periods studied.

Correct Answer: (D) The average number of department leaders reporting directly to their CEO rose over the three periods studied.

Solution:
Option (D) supports the conclusion about growing interest in connecting CEOs with more departments, as it highlights the increase in the number of department leaders reporting to the CEO.

Quick Tip

Look for data that directly support the conclusion of a study, especially trends over time.

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15. When digging for clams, their primary food, sea otters damage the roots of eelgrass plants growing on the seafloor. Near Vancouver Island in Canada, the otter population is large and well established, yet the eelgrass meadows are healthier than those found elsewhere off Canada's coast. To explain this, conservation scientist Erin Foster and colleagues compared the Vancouver Island meadows to meadows where otters are absent or were reintroduced only recently. Finding that the Vancouver Island meadows have a more diverse gene pool than the others do, Foster hypothesized that damage to eelgrass roots increases the plant's rate of sexual reproduction; this, in turn, boosts genetic diversity, which benefits the meadow's health overall.

Which finding, if true, would most directly undermine Foster's hypothesis?

(A) At some sites in the study, eelgrass meadows are found near otter populations that are

small and have only recently been reintroduced.

(B) At several sites not included in the study, there are large, well-established sea otter populations but no eelgrass meadows.

(C) At several sites not included in the study, eelgrass meadows' health correlates negatively with the length of residence and size of otter populations.

(D) At some sites in the study, the health of plants unrelated to eelgrass correlates negatively with the length of residence and size of otter populations.

Correct Answer: (C) At several sites not included in the study, eelgrass meadows' health correlates negatively with the length of residence and size of otter populations.

Solution:

Option (C) contradicts Foster's hypothesis by suggesting that otter populations negatively impact eelgrass health at certain sites. This undermines the idea that otter-induced damage to roots boosts eelgrass reproduction.

Quick Tip

When evaluating hypotheses, pay attention to findings that directly contradict the main argument.

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16. Scholars have noted that F. Scott Fitzgerald's writings were likely influenced in part by his marriage to Zelda Fitzgerald, but many don't recognize Zelda as a writer in her own right. Indeed, Zelda authored several works herself, such as the novel Save Me the Waltz and numerous short stories. Thus, those who primarily view Zelda as an inspiration for F. Scott's writings

Which choice most logically completes the text?

(A) overlook the many other factors that motivated F. Scott to write.

(B) risk misrepresenting the full range of Zelda's contributions to literature.

(C) may draw inaccurate conclusions about how F. Scott and Zelda viewed each other's works.
(D) tend to read the works of F. Scott and Zelda in an overly autobiographical light.

Correct Answer: (B) risk misrepresenting the full range of Zelda's contributions to literature.

Solution:

Option (B) addresses the concern that focusing solely on Zelda as inspiration for F. Scott's works ignores her own contributions as a writer. The other options do not directly align with the point made in the text.

Quick Tip

When analyzing the influence of a person's relationships on their work, make sure to consider both the person's contributions and how their relationship may have shaped their work.

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17. Among social animals that care for their young, such as chickens, macaque monkeys, and humans, newborns appear to show an innate attraction to faces and face-like stimuli. Elisabette Versace and her colleagues used an image of three black dots arranged in the shape of eyes and a nose or mouth to test whether this trait also occurs in `Testudo tortoises`, which live alone and do not engage in parental care. They found that tortoise hatchlings showed a significant preference for the image, suggesting that ____

(A) face-like stimuli are likely perceived as harmless by newborns of social species that practice parental care but as threatening by newborns of solitary species without parental care.
(B) researchers should not assume that an innate attraction to face-like stimuli is necessarily an adaptation related to social interaction or parental care.
(C) researchers can assume that the attraction to face-like stimuli that is seen in social species that practice parental care is learned rather than innate.
(D) newly hatched `Testudo` tortoises show a stronger preference for face-like stimuli than adult

Testudo tortoises do.

Correct Answer: (B) researchers should not assume that an innate attraction to face-like stimuli is necessarily an adaptation related to social interaction or parental care.

Solution:

The study suggests that the attraction to face-like stimuli is not necessarily an adaptation linked to social interaction or parental care, particularly since tortoises, a solitary species, show this preference.

Quick Tip

When reading studies on animal behavior, consider how the species' social structure influences the traits being tested.

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18. Compiled in the late 1500s largely through the efforts of indigenous scribes, *Cantares Mexicanos* is the most important collection of poetry in Classical Nahuatl, the principal language of the Aztec Empire. The poems portray Aztec society before the occupation of the empire by the army of Spain, and marginal notes in *Cantares Mexicanos* indicate that much of the collection's content predates the initial invasion. Nonetheless, some of the poems contain inarguable references to beliefs and customs common in Spain during this era. Thus, some scholars have concluded that ____

(A) while its content largely predates the invasion, *Cantares Mexicanos* also contains additions made after the invasion.

(B) although those who compiled *Cantares Mexicanos* were fluent in Nahuatl, they had limited knowledge of the Spanish language.

(C) before the invasion by Spain, the poets of the Aztec Empire borrowed from the literary traditions of other societies.

(D) the references to beliefs and customs in Spain should be attributed to a coincidental re-

semblance between the societies of Spain and the Aztec Empire.

Correct Answer: (A) while its content largely predates the invasion, *Cantares Mexicanos* also contains additions made after the invasion.

Solution:

The text points out that while most of the content in *Cantares Mexicanos* predates the invasion, some parts reflect changes or additions that occurred after the invasion, making (A) the best choice.

Quick Tip

Focus on historical texts that include both original and later alterations, as they often reflect the influence of external events or invasions.

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19. In a study of the cognitive abilities of white-faced capuchin monkeys (*Cebus imitator*), researchers neglected to control for the physical difficulty of the tasks they used to evaluate the monkeys. The cognitive abilities of monkeys given problems requiring little dexterity, such as sliding a panel to retrieve food, were judged by the same criteria as were those of monkeys given physically demanding problems, such as unscrewing a bottle and inserting a straw. The results of the study, therefore, ____

(A) could suggest that there are differences in cognitive ability among the monkeys even though such differences may not actually exist.

(B) are useful for identifying tasks that the monkeys lack the cognitive capacity to perform but not for identifying tasks that the monkeys can perform.

(C) should not be taken as indicative of the cognitive abilities of any monkey species other than *C. imitator*.

(D) reveal more about the monkeys' cognitive abilities when solving artificial problems than when solving problems encountered in the wild.

Correct Answer: (A) could suggest that there are differences in cognitive ability among the monkeys even though such differences may not actually exist.

Solution:

The researchers did not account for the physical difficulty of the tasks, which may lead to misleading conclusions about cognitive ability. The study might suggest differences that don't exist due to unbalanced task difficulty.

Quick Tip

Ensure that experiments control for all variables to avoid drawing misleading conclusions.

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20. To survive when water is scarce, embryos inside African turquoise killifish eggs ____ a dormant state known as diapause. In this state, embryonic development is paused for as long as two years—longer than the life span of an adult killifish.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) enter

(B) having entered

(C) entering

(D) entering

Correct Answer: (A) enter

Solution:

"Enter" is the correct verb tense to maintain grammatical consistency and clarity in this context. The other options either alter the meaning or disrupt the sentence flow.

Quick Tip

When completing sentences, ensure that verb tenses match the intended meaning and structure.

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21. Formed in 1967 to foster political and economic stability within the Asia-Pacific region, the Association of Southeast Asian Nations was originally made up of five members: Thailand, the Philippines, Singapore, Malaysia, and Indonesia. By the end of the 1990s, the organization ____ its initial membership.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) has doubled
(B) had doubled
(C) doubles
(D) will double

Correct Answer: (B) had doubled

Solution:

The past perfect tense "had doubled" is used here to describe an action completed before another past event (the end of the 1990s).

Quick Tip

Use the past perfect tense to describe an action completed before another action in the past.

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22. The intense pressure found in the deep ocean can affect the structure of proteins in fish's cells, distorting the protein's shape. The chemical trimethylamine N-oxide (TMAO) counters this effect, ensuring that proteins retain their original

____ , which is found in high concentrations in the cells of the deepest-dwelling fish.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) configurations, TMAO

(B) configurations TMAO

(C) configurations, TMAO

(D) configurations and TMAO

Correct Answer: (A) configurations, TMAO

Solution:

The comma is needed for clarity between the noun "configurations" and the following item "TMAO" as it is not directly part of the first phrase.

Quick Tip

In technical writing, use commas to separate related elements for clarity.

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23. Food and the sensation of taste are central to Monique Truong's novels. In *The Book of Salt*, for example, the child character of Binh connects to his native Saigon through the food he prepares, while in *Bitter in the Mouth*, the character of Linda—a form of synesthesia whereby the words she hears evoke tastes.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) experienced

(B) had experienced

(C) experiences

(D) will be experiencing

Correct Answer: (B) had experienced

Solution:

The past perfect tense "had experienced" correctly indicates an action completed before another past event.

Quick Tip

Use the past perfect tense to show that an event happened before another past event.

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24. Inventor John Friedman created a prototype of the first flexible straw by inserting a screw into a paper straw and, using dental floss, binding the straw tightly around the ____ when the floss and screw were removed, the resulting corrugations in the paper allowed the straw to bend easily over the edge of a glass.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) screw's threads.
(B) screws' threads.
(C) screw's threads.
(D) screws' threads'.

Correct Answer: (A) screw's threads.

Solution:

The possessive form "screw's threads" is correct, indicating that the threads belong to the screw. The other options are incorrect forms of possession.

Quick Tip

Use the possessive form (apostrophe + s) to show ownership or association.

25. In her analysis of Edith Wharton's *The House of Mirth* (1905), scholar Candace Wald observes that the novel depicts the upper classes of New York society as "consumed by the appetite of a soulless materialism"—an apt assessment given that *The House of Mirth* is set during the Gilded Age, a period marked by rapid industrialization, economic greed, and widening wealth disparities.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) materialism"; and
(B) materialism" and
(C) materialism,"
(D) materialism"

Correct Answer: (C) materialism,"

Solution:
The correct punctuation is placing the comma inside the quotation mark in (C), following the conventions of Standard English.

Quick Tip

When using quotation marks, punctuation like commas and periods generally go inside the quotation marks.

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26. To humans, it does not appear that the golden orb-weaver spider uses camouflage to capture its orb—the brightly colored arachnid seems to stand out conspicuously in the center of its large circular web for insects to approach. Researcher Po Peng of the University of Melbourne has explained that the spider's distinctive coloration may in fact be part of its appeal.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) prey, rather.

(B) prey rather,

(C) prey, rather;

(D) prey, rather.

Correct Answer: (D) prey, rather.

Solution:

The correct punctuation is placing the comma after "prey" to separate the contrasting phrase "rather" from the rest of the sentence.

Quick Tip

Use commas to separate contrasting elements within a sentence for clarity.

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27. In Death Valley National Park's Racetrack Playa, a flat, dry lakebed, are 162 rocks—some weighing less than a pound but others almost 700 pounds—that move periodically from place to place, seemingly of their own volition. Racetrack-like trails in the ____ mysterious.

(A) plays sediment mark the rock's

(B) playa's sediment mark the rocks

(C) playa's sediment mark the rocks'

(D) playa's sediment mark the rocks

Correct Answer: (D) playa's sediment mark the rocks

Solution:

The phrase "playa's sediment" correctly refers to the sediment in the context of the moving

rocks. The possessive form "playa's" is needed for clarity.

Quick Tip

Be sure to correctly use possessive forms to indicate ownership or association.

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28. In crafting her fantasy fiction, Nigerian-born British author Helen Oyeyemi has drawn inspiration from the classic nineteenth-century fairy tales of the Brothers Grimm. Her 2014 novel *Boy, Snow, Bird*, for instance, is a complex retelling of the story of Snow White, while her 2019 novel *Gingerbread* offers a delicious twist on the classic tale of Hansel and Gretel.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) Gingerbread—

(B) Gingerbread,

(C) Gingerbread.

(D) Gingerbread:

Correct Answer: (C) Gingerbread.

Solution:

The period after "Gingerbread" is necessary because the sentence ends there and the next sentence starts with a new idea.

Quick Tip

Use periods to indicate the end of a sentence for proper punctuation.

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29. While researching a topic, a student has taken the following notes:

- NASA uses rovers, large remote vehicles with wheels, to explore the surface of Mars.

- NASA's rovers can't explore regions inaccessible to wheeled vehicles.
- Rovers are also heavy, making them difficult to land on the planet's surface.
- Microprobes, robotic probes that weigh as little as 50 milligrams, could be deployed virtually anywhere on the surface of Mars.
- Microprobes have been proposed as an alternative to rovers.

The student wants to explain an advantage of microprobes. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(A) Despite being heavy, NASA's rovers can land successfully on the surface of Mars.
(B) Microprobes, which weigh as little as 50 milligrams, could explore areas of Mars that are inaccessible to NASA's heavy, wheeled rovers.
(C) NASA currently uses its rovers on Mars, but microprobes have been proposed as an alternative.
(D) Though they are different sizes, both microprobes and rovers can be used to explore the surface of Mars.

Correct Answer: (B) Microprobes, which weigh as little as 50 milligrams, could explore areas of Mars that are inaccessible to NASA's heavy, wheeled rovers.

Solution:
Option (B) directly addresses the key advantage of microprobes, as they are light enough to access areas that rovers cannot.

Quick Tip

When explaining an advantage, focus on the specific benefit mentioned in the notes.

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30. While researching a topic, a student has taken the following notes:
- Abdulrazak Gurnah was awarded the 2021 Nobel Prize in Literature.
- Gurnah was born in Zanzibar in East Africa and currently lives in the United Kingdom.

- Many readers have singled out Gurnah's 1994 book *Paradise* for praise.
- *Paradise* is a historical novel about events that occurred in colonial East Africa.

The student wants to introduce *Paradise* to an audience unfamiliar with the novel and its author. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(A) Abdulrazak Gurnah, who wrote *Paradise* and later was awarded the Nobel Prize in Literature, was born in Zanzibar in East Africa and currently lives in the United Kingdom.
(B) Many readers have singled out Abdulrazak Gurnah's 1994 book *Paradise*, a historical novel about colonial East Africa, for praise.
(C) A much-praised historical novel about colonial East Africa, *Paradise* (1994) was written by Abdulrazak Gurnah, winner of the 2021 Nobel Prize in Literature.
(D) *Paradise* is a historical novel about events that occurred in colonial East Africa, Abdulrazak Gurnah's homeland.

Correct Answer: (A) Abdulrazak Gurnah, who wrote *Paradise* and later was awarded the Nobel Prize in Literature, was born in Zanzibar in East Africa and currently lives in the United Kingdom.

Solution:
Option (A) most effectively introduces the novel *Paradise* along with relevant details about Gurnah's background and recognition.

Quick Tip

When introducing an author or their work, highlight both the work's importance and the author's background for context.

---

31. While researching a topic, a student has taken the following notes:
- Ulaanbaatar is the capital of Mongolia.

- The city's population is 907,802.
- Ulaanbaatar contains 31.98 percent of Mongolia's population.
- Hanoi is the capital of Vietnam.
- The city's population is 7,781,631.

Which choice most effectively uses information from the notes to emphasize the relative sizes of the two capitals' populations?

(A) Mongolia's capital is Ulaanbaatar, which has 907,802 people, and Vietnam's capital is Hanoi, which has 7,781,631 people.
(B) The populations of the capitals of Mongolia and Vietnam are 907,802 (Ulaanbaatar) and 7,781,631 (Hanoi), respectively.
(C) Even though Hanoi (population 7,781,631) is larger than Ulaanbaatar (population 907,802), Ulaanbaatar accounts for more of its country's population.
(D) Comparing Vietnam and Mongolia, 7,781,631 is 8.14 percent of Vietnam's population, and 907,802 is 31.98 percent of Mongolia's.

Correct Answer: (C) Even though Hanoi (population 7,781,631) is larger than Ulaanbaatar (population 907,802), Ulaanbaatar accounts for more of its country's population.

Solution:
Option (C) highlights the important point about the relative sizes of the populations in the capitals as a proportion of each country's total population.

Quick Tip

When emphasizing differences in population sizes, consider using percentages to show the relative importance within each country.

---

32. While researching a topic, a student has taken the following notes:
- One of history's greatest libraries was the House of Wisdom in Baghdad, Iraq.

- It was founded in the eighth century with the goal of preserving all the world's knowledge.
- Scholars at the House of Wisdom collected ancient and contemporary texts from Greece, India, and elsewhere and translated them into Arabic.
- The House of Wisdom used Chinese papermaking technology to create paper versions to be studied and shared.

The student wants to explain how the House of Wisdom preserved the world's knowledge. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(A) The House of Wisdom was known for bringing together knowledge from around the world, including from Greece, India, and China.
(B) Founded in Iraq in the eighth century, the House of Wisdom employed many scholars as translators.
(C) Writings from the Greek philosopher Aristotle and the Indian mathematician Aryabhata were preserved at the House of Wisdom.
(D) The House of Wisdom collected writings from different countries and created paper versions in Arabic to be studied and shared.

Correct Answer: (D) The House of Wisdom collected writings from different countries and created paper versions in Arabic to be studied and shared.

Solution:
Option (D) focuses directly on how the House of Wisdom preserved and shared knowledge.

Quick Tip

When discussing the preservation of knowledge, emphasize the methods used for gathering, storing, and sharing information.

---

33. While researching a topic, a student has taken the following notes:
- British musicians John Lennon and Paul McCartney shared writing credit for numerous Bea-

tles songs.

- Many Lennon-McCartney songs were actually written by either Lennon or McCartney, not by both.
- The exact authorship of specific parts of many Beatles songs, such as the verse for "In My Life," is disputed.
- Mark Glickman, Jason Brown, and Ryan Song used statistical methods to analyze the musical content of Beatles songs.
- They concluded that there is 18.9% probability that McCartney wrote the verse for "In My Life," stating that the verse is "consistent with Lennon's songwriting style."

The student wants to make a generalization about the kind of study conducted by Glickman, Brown, and Song. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(A) Based on statistical analysis, Glickman, Brown, and Song claim that John Lennon wrote the verse of "In My Life."
(B) There is only an 18.9% probability that Paul McCartney wrote the verse for "In My Life"; John Lennon is the more likely author.
(C) It is likely that John Lennon, not Paul McCartney, wrote the verse for "In My Life."
(D) Researchers have used statistical methods to address questions of authorship within the field of music.

Correct Answer: (A) Based on statistical analysis, Glickman, Brown, and Song claim that John Lennon wrote the verse of "In My Life."

Solution:

The notes indicate that Glickman, Brown, and Song's statistical analysis led them to conclude a specific probability about the authorship of the verse in question. Option (A) best summarizes the type of study conducted.

Quick Tip

When making generalizations based on research notes, focus on the conclusions drawn from specific findings or statistical analysis.

Reading and Writing

(Module 2)

Directions :

The questions in this section address a number of important reading and writing skills. Each question includes one or more passages, which may include a table or graph. Read each passage and question carefully, and then choose the best answer to the question based on the passage(s). All questions in this section are multiple-choice with four answer choices. Each question has a single best answer.

1. The Mule Bone, a 1930 play written by Zora Neale Hurston and Langston Hughes, is perhaps the best-known of the few examples of ____ in literature. Most writers prefer working alone, and given that working together cost Hurston and Hughes their friendship, it is not hard to see why.

(A) characterization

(B) interpretation

(C) collaboration

(D) commercialization

Correct Answer: (C) collaboration

Solution:

The context of the text refers to the relationship between Hurston and Hughes, which is best described as a collaboration. The other options do not fit the context of the question.

Quick Tip

When analyzing literature, pay attention to key terms like "friendship" or "teamwork" to identify collaboration.

---

2. The process of mechanically recycling plastics is often considered ____ because

of the environmental impact and the loss of material quality that often occurs. But chemist Takunda Chazovachii has helped develop a cleaner process of chemical recycling that converts superabsorbent polymers from diapers into a desirable reusable adhesive.

(A) resilient

(B) inadequate

(C) dynamic

(D) satisfactory

Correct Answer: (B) inadequate

Solution:

The word "inadequate" fits well with the context, indicating that mechanical recycling is often considered insufficient because of environmental and material quality concerns.

Quick Tip

Look for words that reflect limitations or shortcomings in the context of environmental concerns.

---

3. Interruptions in the supply chain for microchips used in personal electronics have challenged an economist's assertion that retailers can expect robust growth in sales of those devices in the coming months. The delays are unlikely to ____ her projection entirely but will almost certainly extend its time frame.

(A) dispute

(B) withdraw

(C) underscore

(D) invalidate

Correct Answer: (D) invalidate

Solution:

The context suggests that the delays may extend the time frame of the projection but will not completely disprove it, making "invalidate" the most appropriate choice.

Quick Tip

In business contexts, look for words that suggest uncertainty or adjustments rather than complete negation.

---

4. For her 2021 art installation *Anthem*, Wu Tsang joined forces with singer and composer Beverly Glenn-Copeland to produce a piece that critics found truly ____: they praised Tsang for creatively transforming a museum rotunda into a dynamic exhibit by projecting filmed images of Glenn-Copeland onto a massive 84-foot curtain and filling the space with the sounds of his and other voices singing.

(A) restrained

(B) inventive

(C) inexplicable

(D) mystifying

Correct Answer: (B) inventive

Solution:

The word "inventive" best captures the idea of creative transformation that the critics praised. The other options do not convey the positive nature of the praise.

Quick Tip

When analyzing art or performance, look for words that emphasize creativity, originality, and innovation.

---

5. Some scientists have suggested that mammals in the Mesozoic era were not a very ____ group, but paleontologist Zhe-Xi Luo's research suggests that early mammals living in the shadow of dinosaurs weren't all ground-dwelling insectivores. Fossils of various plant-eating mammals have been found in China, including species like *Vilevolodon diplomylos*, which Luo says could glide like a flying squirrel.

(A) predatory

(B) obscure

(C) diverse

(D) localized

Correct Answer: (C) diverse

Solution:

The term "diverse" best fits the context, as the research suggests that early mammals were not just one type, but included many different species, including those that glided.

Quick Tip

When discussing groups of animals or species, terms like "diverse" or "varied" often describe a wide range of characteristics or behaviors.

---

6. The following text is adapted from Gwendolyn Bennett's 1926 poem "Street Lamps in Early Spring."

Night wears a garment

All velvet soft, all violet blue...

And over her face she draws a veil

As shimmering fine as floating dew...

And here and there

In the black of her hair

The subtle hands of Night

Move slowly with their gem-starred light.

Which choice best describes the overall structure of the text?

(A) It presents alternating descriptions of night in a rural area and in a city.

(B) It sketches an image of nightfall, then an image of sunrise.

(C) It makes an extended comparison of night to a human being.

(D) It portrays how night changes from one season of the year to the next.

Correct Answer: (C) It makes an extended comparison of night to a human being.

Solution:

The text compares night to a human with references to a garment and a veil, making option (C) the correct choice.

Quick Tip

When analyzing poetry, pay attention to metaphors and comparisons that attribute human qualities to non-human elements.

---

7. According to historian Vicki L. Ruiz, Mexican American women made crucial contributions to the labor movement during World War II. At the time, food processing companies entered into contracts to supply United States armed forces with canned goods. Increased production quotas conferred greater bargaining power on the companies' employees, many of whom were Mexican American women:

employees insisted on more favorable benefits, and employers, who were anxious

to fulfill the contracts, complied. **Thus, labor activism became a platform for Mexican American women to assert their agency.**

Which choice best describes the function of the underlined portion(italic text) in the text as a whole?

(A) It elaborates on a claim about labor relations in a particular industry made earlier in the text.
(B) It offers an example of a trend in the World War II-era economy discussed earlier in the text.
(C) It notes a possible exception to the historical narrative of labor activism sketched earlier in the text.
(D) It provides further details about the identities of the workers discussed earlier in the text.

Correct Answer: (A) It elaborates on a claim about labor relations in a particular industry made earlier in the text.

Solution:
The underlined portion provides further detail and clarification about the labor relations in food processing during World War II, directly elaborating on a claim made earlier.

Quick Tip

When identifying the function of a portion of text, consider how it connects to and expands upon previous points in the passage.

---

8. The following text is adapted from Zora Neale Hurston's 1921 short story "John Redding Goes to Sea." "John" is a child who lives in a town in the woods.

Perhaps ten-year-old John was puzzling to the folk there in the Florida woods for he was an imaginative child and fond of day-dreams. The St. John River flowed a scarce three hundred

feet from his back door. On its banks at this point grow numerous palms, luxuriant magnolias and bay trees. On the bosom of the stream float millions of delicately colored hyacinths. *John Redding loved to wander down to the water's edge, and, casting in dry twigs, watch them sail away down stream to Jacksonville, the sea, the wide world and he wanted to follow them.*

Which choice best describes the function of the underlined sentence in the text as a whole?

(A) It provides an extended description of a location that John likes to visit.
(B) It reveals that some residents of John's town are confused by his behavior.
(C) It illustrates the uniqueness of John's imagination compared to the imaginations of other children.
(D) It suggests that John longs to experience a larger life outside the Florida woods.

Correct Answer: (D) It suggests that John longs to experience a larger life outside the Florida woods.

Solution:
The underlined sentence highlights John's desire to explore the world beyond his immediate surroundings, making option (D) the best choice.

Quick Tip

Look for clues in the text that indicate a character's longing for something beyond their current environment or situation.

---

9. The following text is adapted from Oscar Wilde's 1891 novel *The Picture of Dorian Gray*. Dorian Gray is taking his first look at a portrait that Hallward has painted of him.

Dorian passed listlessly in front of his picture and turned towards it. When he saw it he drew back, and his cheeks flushed for a moment with pleasure. A look of joy came into his eyes, as

if he had recognized himself for the first time. He stood there motionless and in wonder, dimly conscious that Hallward was speaking to him, but not catching the meaning of his words. The sense of his own beauty came on him like a revelation. He had never felt it before.

According to the text, what is true about Dorian?

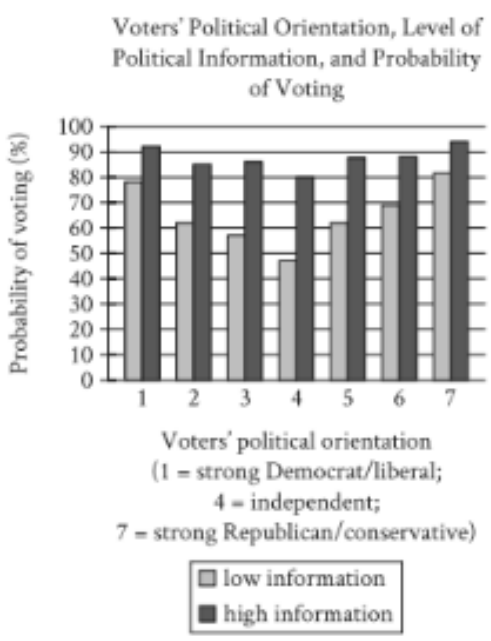
(A) He wants to know Hallward's opinion of the portrait.
(B) He is delighted by what he sees in the portrait.
(C) He prefers portraits to other types of paintings.
(D) He is uncertain of Hallward's talent as an artist.

Correct Answer: (B) He is delighted by what he sees in the portrait.

Solution:
The text suggests that Dorian experiences joy upon seeing his portrait, making option (B) the correct choice.

Quick Tip

Pay attention to key phrases in the text that describe a character's emotional response, such as "joy" or "pleasure."



Economists Kerwin Kofi Charles and Melvin Stephens Jr. investigated a variety of factors that influence voter turnout in the United States. Using survey data that revealed whether respondents voted in national elections and how knowledgeable respondents are about politics, Charles and Stephens claim that the likelihood of voting is driven in part by potential voters' confidence in their assessments of candidates—essentially, the more informed voters are about politics, the more confident they are at evaluating whether candidates share their views, and thus the more likely they are to vote.

10. Which choice best describes data in the graph that support Charles and Stephens's claim?

(A) At each point on the political orientation scale, high-information voters were more likely than low-information voters to vote.

(B) Only low-information voters who identify as independents had a voting probability below 50%.

(C) The closer that low-information voters are to the ends of the political orientation scale, the more likely they were to vote.

(D) High-information voters were more likely to identify as strong Democrats or strong Republicans than low-information voters were.

Correct Answer: (A) At each point on the political orientation scale, high-information voters were more likely than low-information voters to vote.

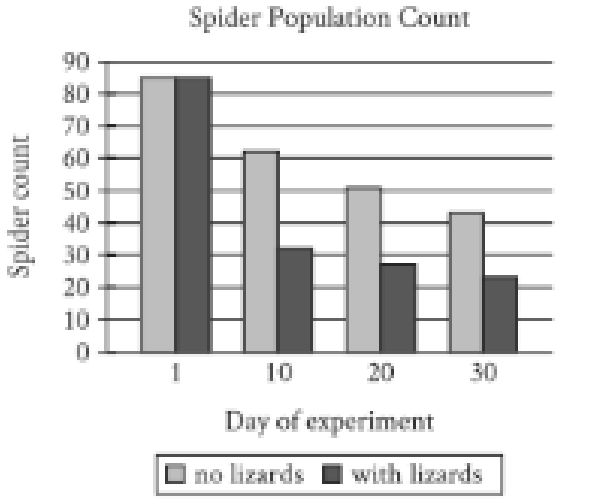
Solution:

The graph shows that at each point on the political orientation scale, the probability of voting was consistently higher for high-information voters compared to low-information voters, which supports the claim that high-information voters are more likely to vote.

Quick Tip

When interpreting graphs, pay attention to how data trends align with claims made in the accompanying text, especially when comparing different groups.

11.



To investigate the effect of lizard predation on spider populations, a student in a biology class placed spiders in two enclosures, one with lizards and one without, and tracked the number of spiders in the enclosures for 30 days. The student concluded that the reduction in the spider population count in the enclosure with lizards by day 30 was entirely attributable to the presence of the lizards.

Which choice best describes data from the graph that weakens the student's conclusion?

(A) The spider population count was the same in both enclosures on day 1.

(B) The spider population count also substantially declined by day 30 in the enclosure without lizards.

(C) The largest decline in spider population count in the enclosure with lizards occurred from day 1 to day 10.

(D) The spider population count on day 30 was lower in the enclosure with lizards than in the enclosure without lizards.

Correct Answer: (B) The spider population count also substantially declined by day 30 in the enclosure without lizards.

Solution:

The graph shows that the spider population declined in both enclosures, even in the absence of lizards. This weakens the student's conclusion that the reduction in the spider population in the enclosure with lizards was entirely due to the lizards.

Quick Tip

When analyzing graphs, always consider alternative explanations that could account for the trends observed in the data.

---

12. Archaeologist Petra Vaiglova, anthropologist Xinyi Liu, and their colleagues investigated the domestication of farm animals in China during the Bronze Age (approximately 2000 to 1000 BCE). By analyzing the animal bone composition of the bones of sheep, goats, and cattle from this era, the team determined that sheep and cattle may be the culled sheep's and goat's diets, while the cattle's diet consisted largely of millet, a crop cultivated by humans. The researchers concluded that cattle were likely raised closer to human settlements, whereas sheep and goats were moved farther away.

Which finding, if true, would most strongly support the team's conclusion?

(A) Analysis of animal bones showed that the cattle's diet also consisted of wheat, which was widely cultivated in China during the Bronze Age.
(B) Further investigation of sheep and goat bones revealed that their diets consisted of small portions of millet as well.
(C) Cattle's diets generally require larger amounts of food and a greater variety of nutrients than those of sheep's and goat's diets.
(D) The diets of sheep, goats, and cattle were found to vary based on what farmers in each Bronze Age settlement could grow.

Correct Answer: (C) Cattle's diets generally require larger amounts of food and a greater variety of nutrients than those of sheep's and goat's diets.

Solution:
The claim that cattle were likely raised closer to human settlements depends on the idea that cattle required more food and varied nutrients, which would necessitate living closer to agricultural areas where such food was abundant.

Quick Tip

Look for findings that provide direct support for conclusions regarding the behavior or movement of animals in relation to human activities.

---

13. Mosasaurs were large marine reptiles that lived in the Late Cretaceous period, approximately 100 million to 66 million years ago. Celina Suarez, Alberto Pérez-Huerta, and T. Lynn Harrell Jr. examined oxygen-18 isotopes in mosasaur tooth enamel in order to calculate likely mosasaur body temperatures and determined that mosasaurs were endothermic—that is, they used internal metabolic processes to maintain a stable body temperature in a variety of environmental temperatures. Suarez, Pérez-Huerta, and Harrell claim that endothermy would have enabled mosasaurs to include relatively cold polar waters in their range.

Which finding, if true, would most directly support Suarez, Pérez-Huerta, and Harrell's claim?

(A) Mosasaurs' likely body temperatures are easier to determine from tooth enamel oxygen-18 isotope data than the body temperatures of nonendothermic Late Cretaceous marine reptiles are.
(B) Fossils of both mosasaurs and nonendothermic marine reptiles have been found in roughly equal numbers in regions known to be near the poles during the Late Cretaceous, though in lower concentrations than elsewhere.
(C) Several mosasaur fossils have been found in regions known to be near the poles during the Late Cretaceous, while relatively few fossils of nonendothermic marine reptiles have been found in those locations.
(D) During the Late Cretaceous, seawater temperatures were likely higher throughout mosasaurs' range, including near the poles, than seawater temperatures at those same latitudes are today.

Correct Answer: (C) Several mosasaur fossils have been found in regions known to be near the poles during the Late Cretaceous, while relatively few fossils of nonendothermic marine reptiles have been found in those locations.

Solution:
The discovery of mosasaur fossils near the poles supports the claim that they were endothermic, as their ability to maintain stable body temperatures would have enabled them to live in colder waters compared to nonendothermic marine reptiles.

Quick Tip

Look for findings that directly relate to the ability of animals to survive in extreme conditions based on their physiological characteristics.

---

14. Researchers hypothesized that a decline in the population of dusky sharks near the mid-Atlantic coast of North America led to a decline in the population of rays

that consume the prey of these sharks. Dusky sharks do not typically consume rays themselves but do consume cowfish species, which are the main predators of the oysters.

Which finding, if true, would most directly support the researchers' hypothesis?

(A) Declines in the number of eastern dusky sharks' prey in the region downstream of the sharks' population coincide with regional declines in dusky shark abundance.
(B) Eastern oyster abundance tends to be greater in areas with both dusky sharks and cownose rays than in areas with only dusky sharks.
(C) Consumption of eastern cowries by cownose rays in the region significantly increased before the regional decline in dusky shark abundance began.
(D) Cownose rays have increased in regional abundance as dusky sharks have decreased in regional abundance.

Correct Answer: (D) Cownose rays have increased in regional abundance as dusky sharks have decreased in regional abundance.

Solution:
The direct correlation between the decrease in dusky sharks and the increase in cownose rays suggests that the removal of sharks allowed rays to proliferate, supporting the hypothesis that sharks are indirectly controlling the ray population.

Quick Tip

When analyzing ecological data, look for direct relationships between predator and prey populations that support the claim of interdependence.

---

15. Political scientists who favor the traditional view of voter behavior claim that voting in an election does not change a voter's attitude toward the candidates in that election. Focusing on each US presidential election from 1976 to 1996, Ebonya

Washington and Sendhil Mullainathan tested this claim by distinguishing between subjects who had just become old enough to vote (around half of whom actually voted) and otherwise similar subjects who were slightly too young to vote (and thus none of whom voted). Washington and Mullainathan compared the attitudes of the groups of subjects toward the winning candidate two years after each election.

Which finding from Washington and Mullainathan's study, if true, would most directly weaken the claim made by people who favor the traditional view of voter behavior?

(A) Subjects' attitudes toward the winning candidate two years after a given election were strongly predicted by subjects' general political orientation, regardless of whether subjects were old enough to vote at the time of the election.
(B) Subjects who were not old enough to vote in a given election held significantly more positive attitudes towards the winning candidate two years later than they held at the time of the election.
(C) Subjects who voted in a given election held significantly more polarized attitudes toward the winning candidate two years later than did subjects who were not old enough to vote in that election.
(D) Two years after a given election, subjects who voted and subjects who were not old enough to vote were significantly more likely to express negative attitudes than positive attitudes toward the winning candidate in that election.

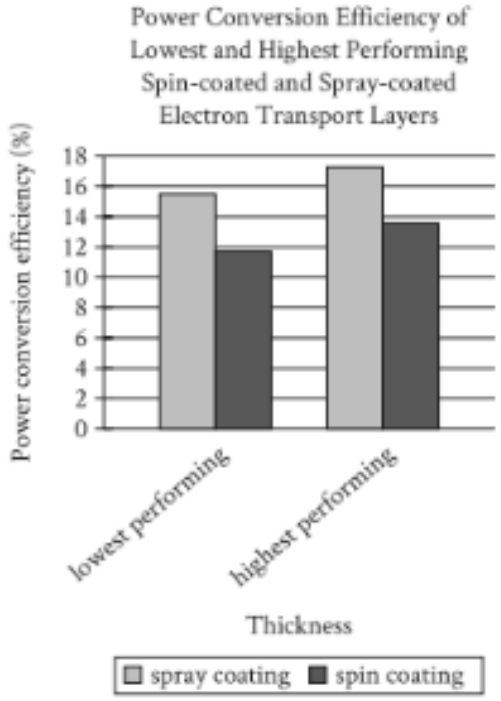
Correct Answer: (B) Subjects who were not old enough to vote in a given election held significantly more positive attitudes towards the winning candidate two years later than they held at the time of the election.

Solution:
This finding suggests that voting in an election has a lasting effect on voters' attitudes, contradicting the traditional view that voting does not alter attitudes toward candidates.

Quick Tip

Consider how changes in attitude over time might challenge claims about static voter behavior after an election.

16.



Perovskite solar cells convert light into electricity more efficiently than earlier kinds of solar cells, and manufacturing advances have recently made them commercially attractive. One limitation of the cells, however, has to do with their electron transport layer (ETL), through which absorbed electrons must pass. Often the ETL is applied through a process called spin coating, but such ETLs are fairly inefficient at converting input power to output power. André Taylor and colleagues tested a novel spray coating method for applying the ETL. The team produced ETLs of various thicknesses and concluded that spray coating holds promise for improving the power conversion efficiency of ETLs in perovskite solar cells.

Which choice best describes data from the graph that support Taylor and colleagues' conclusion?

(A) Both the ETL applied through spin coating and the ETL applied through spray coating showed a power conversion efficiency greater than 10% at their lowest performing thickness.
(B) The lowest performing ETL applied through spray coating had a higher power conversion efficiency than the highest performing ETL applied through spin coating.
(C) The highest performing ETL applied through spray coating showed a power conversion ef-

ficiency of approximately 13%, while the highest performing ETL applied through spin coating showed a power conversion efficiency of approximately 11%.
(D) There was a substantial difference in power conversion efficiency between the lowest and highest performing ETLs applied through spray coating.

Correct Answer: (C) The highest performing ETL applied through spray coating showed a power conversion efficiency of approximately 13%, while the highest performing ETL applied through spin coating showed a power conversion efficiency of approximately 11%.

Solution:
The graph shows that the highest performing ETL applied through spray coating has a power conversion efficiency of approximately 13%. In contrast, the highest performing ETL applied through spin coating only has a power conversion efficiency of approximately 11%. Therefore, option (C) accurately describes the data presented in the graph.

Quick Tip

When analyzing graphs, focus on comparing the numerical values of key data points, particularly when the question refers to differences between data sets.

---

17. While attending school in New York City in the 1980s, Okwui Enwezor encountered new works by African artists in exhibitions, despite New York's reputation as one of the best places to view contemporary art from around the world. According to an arts journalist, later in his career as a renowned curator and art historian, Enwezor sought to remedy this deficiency, not by focusing solely on modern African artists, but by showing how their work fits into the larger context of global modern art and art history.
Which finding, if true, would most directly support the journalist's claim?

(A) As curator of the Haus der Kunst in Munich, Germany, Enwezor organized a retrospective of Ghanaian sculptor El Anatsui's work entitled El Anatsui: Triumphant Scale, one of the

largest art exhibitions devoted to a Black artist in Europe's history.

(B) In the exhibition Postwar: Art Between the Pacific and the Atlantic, 1945–1965, Enwezor and cocurator Katy Siegel brought works by African artists such as Malangatra Ngweya together with pieces by major figures from other countries, like US artist Andy Warhol and Mexico's David Siqueiros.

(C) Enwezor's work as curator of the 2001 exhibition The Short Century: Independence and Liberation Movements in Africa, 1945–1994 showed how African movements for independence from European colonial powers following the Second World War profoundly influenced work by African artists of the period, such as Kamala Ibrahim Ishaq and Thomas Mukarobgwa.

(D) Enwezor organized the exhibition In/Sight: African Photography, 1940 to the Present to emphasize a particular aesthetic trend but to demonstrate how photography has evolved as the medium of choice for African artists.

Correct Answer: (A) As curator of the Haus der Kunst in Munich, Germany, Enwezor organized a retrospective of Ghanaian sculptor El Anatsui's work entitled El Anatsui: Triumphant Scale, one of the largest art exhibitions devoted to a Black artist in Europe's history.

Solution:

The claim mentions that Enwezor sought to remedy the lack of African artists in the broader context of global modern art. Option (A) directly supports this by highlighting an exhibition that is one of the largest devoted to a Black artist in Europe, showing how African artists' work fits into the global context of art.

Quick Tip

When analyzing claims in the arts, consider the direct impact of exhibitions and how they contribute to broader art history.

---

18. For thousands of years, people in the Americas used the bottle gourd, a large bitter fruit with a thick rind, to make bottles, other types of containers, and even musical instruments. Oddly, there is no evidence that any type of bottle gourd is

native to the Western Hemisphere; either the fruit or its seeds must have somehow been carried from Asia or Africa.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) to use

(B) have used

(C) having used

(D) using

Correct Answer: (C) having used

Solution:

The sentence requires a present perfect participle phrase to indicate that the action was ongoing in the past and has relevance to the present. "Having used" fits this structure.

Quick Tip

In English grammar, when referring to an action that was completed before another past action, the phrase "having [verb]" is often the correct form.

---

19. While many video game creators strive to make their graphics ever more realistic, others look to the past, developing titles with visuals inspired by the "8-bit" games of the 1980s and 1990s. (The term "8-bit" refers to a console whose processor could only handle eight bits of data at once.)

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) lifelike but

(B) lifelike

(C) lifelike,

(D) lifelike, but

Correct Answer: (D) lifelike, but

Solution:

The conjunction "but" is necessary to show contrast between the two ideas in the sentence: creators who make lifelike graphics versus those who turn to the past. The comma before "but" is also needed to separate the clauses.

Quick Tip

When using conjunctions like "but," ensure that clauses are properly separated with a comma when needed for clarity.

---

20. In the 1950s, a man named Joseph McVicker was struggling to keep his business afloat when his sister-in-law Kay Zufall advised him to repurpose the company's product, a nontoxic, clay-like substance for removing soot from wallpaper, as a modeling putty for kids. In addition, Zufall ____ selling the product under a child-friendly name: Play-Doh.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) suggested

(B) suggests

(C) had suggested

(D) was suggesting

Correct Answer: (A) suggested

Solution:

The past tense "suggested" is correct because it refers to an action that took place in the past and had an impact on the business strategy.

Quick Tip

Pay attention to verb tenses to maintain consistency in your narrative when describing past events.

---

21. Beatrix Potter is perhaps best known for writing and illustrating children's books such as The Tale of Peter Rabbit (1902), but she also dedicated herself to mycology, the study of ____ more than 350 paintings of the fungal species she observed in nature and submitting her research on spore germination to the Linnean Society of London.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) fungi: producing

(B) fungi. Producing

(C) fungi producing

(D) fungi, producing

Correct Answer: (C) fungi producing

Solution:

The correct answer is (C), where the phrase "fungi producing" fits in the sentence and properly maintains the grammatical flow without requiring any punctuation between the terms. The other options incorrectly add unnecessary punctuation or fail to use the correct structure.

Quick Tip

Inserting the right punctuation in a sentence can change its meaning. In this case, a simple phrase without commas or periods fits better.

---

22. In assessing the films of Japanese director Akira Kurosawa, ____ have missed his equally deep engagement with Japanese artistic traditions such as Noh theater.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) many critics have focused on Kurosawa's use of Western literary sources but
(B) Kurosawa's use of Western literary sources has been the focus of many critics, who
(C) there are many critics who have focused on Kurosawa's use of Western literary sources, but they
(D) the focus of many critics has been on Kurosawa's use of Western literary sources; they

Correct Answer: (C) there are many critics who have focused on Kurosawa's use of Western literary sources, but they

Solution:
Option (C) provides the best structure to maintain grammatical correctness and clarity in expressing that there is a group of critics, some of whom focus on Kurosawa's use of Western literary sources. The structure effectively leads into the contrast.

Quick Tip

When providing contrast in sentences, use "but" effectively and ensure the clauses are correctly joined.

---

23. Joshua Hinson, director of the language revitalization program of the Chickasaw Nation in Oklahoma, helped produce the world's first Indigenous-language instructional app, Chickasaw ____ Chickasaw TV, in 2010; and a Rosetta Stone language course in Chickasaw, in 2015.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) Basic; in 2009, an online television network;
(B) Basic; in 2009, an online television network,
(C) Basic, in 2009; an online television network,
(D) Basic, in 2009, an online television network,

Correct Answer: (D) Basic, in 2009, an online television network,

Solution:

The correct option is (D), where "Basic, in 2009, an online television network," uses commas properly to separate the elements in the sentence. The commas are necessary to set off the year from the description of the network.

Quick Tip

Ensure that when providing additional information (such as dates or clarifications), commas are used to separate the clauses for clarity.

---

24. The forty-seven geothermal springs of Arkansas' Hot Springs National Park are sourced via a process known as natural groundwater recharge, in which rainwater percolates downward through the earth— in this case, the porous rocks of the hills around Hot ____ collect in a subterranean basin.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) Springs to

(B) Springs-to

(C) Springs— to

(D) Springs, to

Correct Answer: (A) Springs to

Solution:

Option (A) is the correct choice. "Springs to" maintains the flow and uses no unnecessary punctuation. The other options either introduce incorrect punctuation or interrupt the sentence flow.

Quick Tip

Use punctuation sparingly and when necessary to ensure the sentence remains clear and free of interruptions.

---

25. Over twenty years ago, in a landmark experiment in the psychology of choice, professor Sheena Iyengar set up a jam-tasting booth at a grocery store. The number of jams available for tasting ____ some shoppers had twenty-four different options, others only six. Interestingly, the shoppers with fewer jams to choose from purchased more jam.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) varied;

(B) varied, while

(C) varied,

(D) varied while

Correct Answer: (C) varied,

Solution:

Option (C) is correct because it uses a simple comma to separate the two clauses. The other options either add unnecessary punctuation or omit it altogether.

Quick Tip

When listing items with differences, ensure that the use of commas and conjunctions is correct for clear separation of ideas.

---

26. Nigerian author Buchi Emecheta's celebrated literary oeuvre includes The Joys of Motherhood, a novel about the changing roles of women in 1950s ____ a television play about the private struggles of a newlywed couple in Nigeria; and Head Above

Water, her autobiography.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) Lagos, A Kind of Marriage,

(B) Lagos: A Kind of Marriage,

(C) Lagos, A Kind of Marriage

(D) Lagos; A Kind of Marriage

Correct Answer: (B) Lagos: A Kind of Marriage,

Solution:

The correct answer is (B), where the colon is used to link the title with the explanation. The comma is unnecessary, and a semicolon would be incorrect because it's not separating two independent clauses.

Quick Tip

Use a colon to introduce explanations or lists. Commas and semicolons serve different functions, so be mindful of their proper usage.

---

27. Chimamanda Ngozi Adichie's 2013 novel Americanah chronicles the divergent experiences of Ifemelu and Obinze, a young Nigerian couple, after high school. Ifemelu moves to the United States to attend a prestigious university. ____ Obinze travels to London, hoping to start a career there. However, frustrated with the lack of opportunities, he soon returns to Nigeria.

Which choice completes the text with the most logical transition?

(A) Meanwhile,

(B) Nevertheless,

(C) Secondly,

(D) In fact,

Correct Answer: (A) Meanwhile,

Solution:

Option (A) is correct as it indicates that while Ifemelu is in the United States, Obinze's story is unfolding in parallel. "Meanwhile" links the two narratives of the characters in different locations.

Quick Tip

Use "Meanwhile" to indicate simultaneous events or actions that are happening in parallel.

---

28. Organisms have evolved a number of surprising adaptations to conserve their water in arid environments. ____ examples of these adaptations include cacti storing water in their stems during periods of drought.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) In contrast,

(B) for example,

(C) consequently,

(D) despite,

Correct Answer: (B) for example,

Solution:

Option (B) is correct as it introduces an example of the adaptations mentioned in the previous sentence. "For example" is used to provide specific examples that support the general statement.

Quick Tip

When providing specific examples in writing, use phrases like "for example" to introduce them clearly.

---

29. In 1933, the Twentieth Amendment to the US Constitution was ratified. The amendment requires that presidential elections be held on January 1st, respectively, even when the November results are delayed. ____ the amendment requires only that Congress approve new rules regarding the election date.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) In fact,

(B) for instance,

(C) specifically,

(D) additionally,

Correct Answer: (C) specifically,

Solution:

The correct option is (C), "specifically," as it introduces more detailed information about the specific requirements of the amendment.

Quick Tip

Use "specifically" to introduce precise details or clarifications that follow a general statement.

---

30. In her poetry collection Thomas and Beulah, Rita Dove intertwines the third-person narrative with personal stories that revolve around Thomas's journey from the American South to the Great Migration, as well as his time in Europe during World War II against the backdrop of the Civil Rights Movement.

Which choice completes the text so that it conforms to the conventions of Standard English?

(A) Thus,
(B) Regardless,
(C) Subsequently,
(D) Similarly,

Correct Answer: (A) Thus,

Solution:
"Thus" is the correct choice because it logically leads from the previous statement about the themes and narrative techniques used in the collection.

Quick Tip

Use "Thus" when summarizing or concluding a statement, especially in academic or formal writing.

---

31. While researching a topic, a student has taken the following notes:
- The Philadelphia and Lancaster Turnpike was a road built between 1792 and 1794.
- It was the first private turnpike in the United States.
- It connected the cities of Philadelphia and Lancaster in the state of Pennsylvania.
- It was sixty-two miles long.

The student wants to emphasize the distance covered by the Philadelphia and Lancaster Turnpike. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(A) The sixty-two-mile-long Philadelphia and Lancaster Turnpike connected the Pennsylvania cities of Philadelphia and Lancaster.
(B) The Philadelphia and Lancaster Turnpike was the first private turnpike in the United

States.

(C) The Philadelphia and Lancaster Turnpike, which connected two Pennsylvania cities, was built between 1792 and 1794.

(D) A historic Pennsylvania road, the Philadelphia and Lancaster Turnpike was completed in 1794.

Correct Answer: (A) The sixty-two-mile-long Philadelphia and Lancaster Turnpike connected the Pennsylvania cities of Philadelphia and Lancaster.

Solution:

Option (A) directly emphasizes the distance of the road (sixty-two miles long) and includes the necessary information about the cities it connects. It best meets the student's goal of emphasizing the distance.

Quick Tip

When emphasizing specific information like distance, include numerical details that directly support your point, and be sure to maintain clarity.

---

32. While researching a topic, a student has taken the following notes:

- Most, but not all, of the Moon's oxygen comes from the Sun, via solar wind.
- Cosmonautics Kentaro Terada from Osaka University wondered if some of the unaccounted-for oxygen could be coming from Earth.
- In 2008, he analyzed data from the Japanese satellite Kaguya.
- Kaguya gathered data about gases and particles it encountered while orbiting the Moon.
- Based on the Kaguya data, Terada confirmed his suspicion that Earth is sending oxygen to the Moon.

The student wants to emphasize the aim of the research study. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(A) As it orbited the Moon, the Kaguya satellite collected data that was later analyzed by cosmonautics Kentaro Terada.
(B) Before 2008, Kentaro Terada wondered if the Moon was receiving some of its oxygen from Earth.
(C) Cosmonautics Kentaro Terada set out to determine whether some of the Moon's oxygen was coming from Earth.
(D) Kentaro Terada's study determined that Earth is sending a small amount of oxygen to the Moon.

Correct Answer: (C) Cosmonautics Kentaro Terada set out to determine whether some of the Moon's oxygen was coming from Earth.

Solution:
Option (C) is the best choice as it directly highlights the goal of Kentaro Terada's research, which is to determine the source of the Moon's oxygen. It is a clear and concise statement of the research aim.

Quick Tip

When emphasizing the aim of a study, highlight the central question or objective of the research.

---

33. While researching a topic, a student has taken the following notes:
- Ducklings expend up to 62.8% less energy when swimming in a line behind their mother than when swimming alone.
- The physics behind this energy savings hasn't always been well understood.
- Naval architect Zhiming Yuan used computer simulations to study the effect of the mother duck's wake.
- The study revealed that ducklings are pushed in a forward direction by the wake's waves.
- Yuan determined this study reduces the effect of wave drag on the ducklings by 158%.

The student wants to present the study and its methodology. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(A) A study revealed that ducklings, which expend up to 62.8% less energy when swimming in a line behind their mother, also experience 158% less drag.
(B) Seeking to understand how ducklings swimming in line behind their mother save energy, Zhiming Yuan used computer simulations to study the effect of the mother duck's wake.
(C) Zhiming Yuan studied the physics behind the fact that by being pushed in a forward direction by waves, ducklings save energy.
(D) Naval architect Zhiming Yuan discovered that ducklings are pushed in a forward direction by the waves of their mother's wake, reducing the effect of drag by 158%.

Correct Answer: (D) Naval architect Zhiming Yuan discovered that ducklings are pushed in a forward direction by the waves of their mother's wake, reducing the effect of drag by 158%.

Solution:
Option (D) clearly presents the findings of the study and the methodology behind them. It effectively integrates the information about energy savings and wave drag reduction.

Quick Tip

When presenting research findings, include the most important results and the methodology behind them to clearly explain the connection between the two.

Maths

DIRECTIONS

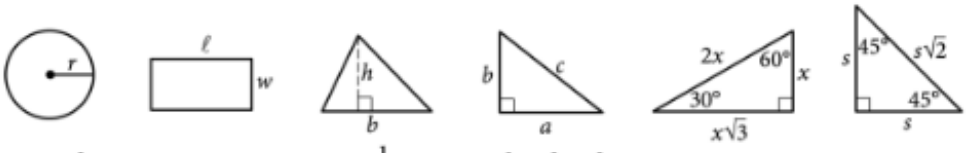
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

Unless otherwise indicated:

- All variables and expressions represent real numbers.
- Figures provided are drawn to scale.
- All figures lie in a plane.
- The domain of a given function f is the set of all real numbers x for which $f(x)$ is a real number.

REFERENCE



$A = \pi r^2$
$C = 2\pi r$

$A = \ell w$

$A = \frac{1}{2}bh$

$c^2 = a^2 + b^2$

Special Right Triangles

$V = \ell wh$

$V = \pi r^2 h$

$V = \frac{4}{3}\pi r^3$

$V = \frac{1}{3}\pi r^2 h$

$V = \frac{1}{3}\ell wh$

The number of degrees of arc in a circle is 360.
The number of radians of arc in a circle is 2π.
The sum of the measures in degrees of the angles of a triangle is 180.

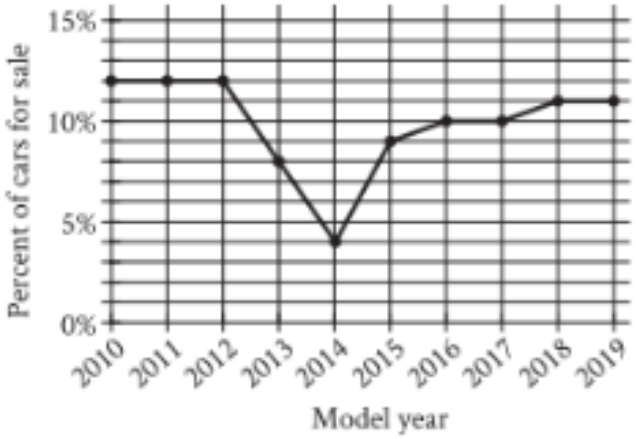
For multiple-choice questions, solve each problem, choose the correct answer from the choices provided, and then circle your answer in this book. Circle only one answer for each question. If you change your mind, completely erase the circle. You will not get credit for questions with more than one answer circled, or for questions with no answers circled.

For student-produced response questions, solve each problem and write your answer next to or under the question in the test book as described below.

- **Once you've written your answer, circle it clearly.** You will not receive credit for anything written outside the circle, or for any questions with more than one circled answer.
- **If you find more than one correct answer, write and circle only one answer.**
- **Your answer can be up to 5 characters for a positive answer and up to 6 characters (including the negative sign) for a negative answer, but no more.**

- **If your answer is a fraction that is too long (over 5 characters for positive, 6 characters for negative), write the decimal equivalent.**
- **If your answer is a decimal that is too long (over 5 characters for positive, 6 characters for negative), truncate it or round it to the fourth digit.**
- **If your answer is a mixed number (such as $3\frac{1}{2}$), write it as an improper fraction ($\frac{7}{2}$) or its decimal equivalent (3.5).**
- **Don't include symbols such as a percent sign, comma, or dollar sign in your circled answer.**

1. The line graph shows the percent of cars for sale at a used car lot on a given day by model year.



For what model year is the percent of cars for sale the smallest?

(A) 2012

(B) 2013

(C) 2014

(D) 2015

Correct Answer: (A) 2012

Solution:

From the given line graph, we analyze the percent of cars for sale for each model year. The graph shows that in 2012, the percentage of cars for sale is the smallest compared to other

years. By looking at the graph and observing the lowest point on the line, we can confirm that 2012 has the lowest percent of cars for sale. Hence, the correct answer is 2012.

Quick Tip

When reading line graphs, the lowest point represents the smallest value. Always pay close attention to this to identify the minimum data points.

---

2. For a particular machine that produces beads, 29 out of every 100 beads it produces have a defect. A bead produced by the machine will be selected at random. What is the probability of selecting a bead that has a defect?

(A) $\frac{1}{2900}$

(B) $\frac{1}{29}$

(C) $\frac{29}{100}$

(D) $\frac{29}{10}$

Correct Answer: (C) $\frac{29}{100}$

Solution:

To find the probability of selecting a bead with a defect, we use the formula for probability:

$$P(\text{Defective Bead}) = \frac{\text{Number of Defective Beads}}{\text{Total Number of Beads}}$$

Given that 29 out of every 100 beads have a defect, the probability is:

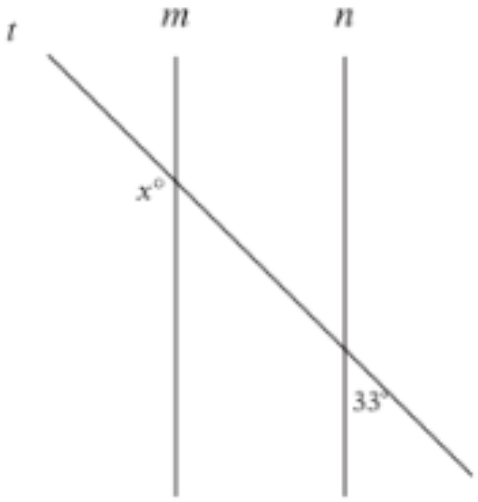
$$P(\text{Defective Bead}) = \frac{29}{100}$$

Thus, the probability of selecting a bead with a defect is $\frac{29}{100}$, which corresponds to option (C).

Quick Tip

In probability, the total number of favorable outcomes is divided by the total number of possible outcomes. Ensure you use the correct values in this formula.

3.



Note: Figure not drawn to scale.

In the figure, line m is parallel to line t, and line t intersects both lines. What is the value of x?

(A) 33

(B) 57

(C) 123

(D) 147

Correct Answer: (A) 33

Solution:

We are given that line m is parallel to line t, and that line t intersects both of them. When two parallel lines are intersected by a transversal, the angles formed on the opposite sides of the transversal are called alternate interior angles. These angles are equal in measure.

In this case, the angle x on line m is an alternate interior angle to the angle formed by line t and the transversal. From the figure, we can see that the angle on line t is 33°, and by the

properties of parallel lines, the value of x must also be 33°. Therefore, the value of x is 33°, and the correct answer is (A).

$$\text{Alternate Interior Angle Theorem:} \quad \angle x = 33^\circ$$

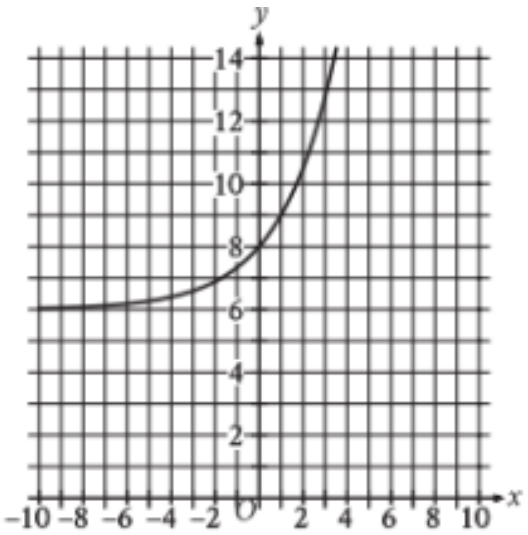
Thus, the value of x is 33°.

Quick Tip

When dealing with parallel lines and transversals, remember that alternate interior angles are congruent (equal). This is useful in determining unknown angle measures.

---

4. What is the y-intercept of the graph shown?



(A) (-8, 0)

(B) (-6, 0)

(C) (0, 6)

(D) (0, -8)

Correct Answer: (D) (0, -8)

Solution:

The y-intercept is the point where the graph intersects the y-axis. From the graph, it can be seen that the line intersects the y-axis at the point $(0, -8)$. Hence, the y-intercept is $(0, -8)$.

Quick Tip

The y-intercept occurs where the value of $x = 0$. Look for the point where the graph crosses the y-axis.

---

5. The total cost $f(x)$, in dollars, to lease a car for 36 months from a particular car dealership is given by $f(x) = 36x + 1,000$, where x is the monthly payment, in dollars. What is the total cost to lease a car when the monthly payment is \$400?

(A) \$13,400

(B) \$13,000

(C) \$15,400

(D) \$37,400

Correct Answer: (C) \$15,400

Solution:

We are given the function $f(x) = 36x + 1,000$, where x is the monthly payment. To find the total cost when the monthly payment is \$400, substitute $x = 400$ into the equation:

$$f(400) = 36(400) + 1,000 = 14,400 + 1,000 = 15,400$$

Therefore, the total cost to lease the car is \$15,400.

Quick Tip

To calculate the total cost, substitute the given monthly payment into the formula and simplify the expression.

---

6. Each side of a square has a length of 45. What is the perimeter of this square?

Solution:

The perimeter P of a square is calculated by the formula:

$$P = 4 \times \text{side length}$$

Given that the side length is 45, the perimeter is:

$$P = 4 \times 45 = 180$$

Thus, the perimeter of the square is 180 units.

Quick Tip

For a square, the perimeter is simply four times the length of one of its sides.

---

7. What is the positive solution to the given equation?

$$\frac{55}{x+6} = x$$

Solution:

To solve the equation $\frac{55}{x+6} = x$, we first multiply both sides by $x + 6$ to eliminate the denominator:

$$55 = x(x + 6)$$

Expanding the right side:

$$55 = x^2 + 6x$$

Now, rearrange the equation to form a quadratic equation:

$$x^2 + 6x - 55 = 0$$

Using the quadratic formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Here, $a = 1$, $b = 6$, and $c = -55$:

$$x = \frac{-6 \pm \sqrt{6^2 - 4(1)(-55)}}{2(1)} = \frac{-6 \pm \sqrt{36 + 220}}{2} = \frac{-6 \pm \sqrt{256}}{2}$$

$$x = \frac{-6 \pm 16}{2}$$

Thus, the two possible solutions are:

$$x = \frac{-6 + 16}{2} = \frac{10}{2} = 5 \quad \text{or} \quad x = \frac{-6 - 16}{2} = \frac{-22}{2} = -11$$

The positive solution is $x = 5$.

Quick Tip

When solving quadratic equations, use the quadratic formula to find all possible solutions, then choose the appropriate one based on the problem's requirements (in this case, the positive solution).

---

8. An object travels at a constant speed of 12 centimeters per second. At this speed, what is the time, in seconds, that it would take for the object to travel 108 centimeters?

(A) 9

(B) 96

(C) 120

(D) 972

Correct Answer: (A) 9

Solution:

We can use the formula for time:

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

Substituting the given values for distance (108 cm) and speed (12 cm/s):

$$\text{Time} = \frac{108}{12} = 9\,\text{seconds}$$

Thus, the time it takes for the object to travel 108 centimeters is 9 seconds.

Quick Tip

When calculating time, use the formula Time $= \frac{\text{Distance}}{\text{Speed}}$ and substitute the appropriate values for distance and speed.

---

9. Data set X: 5, 9, 9, 13

Data set Y: 5, 7, 9, 13

The lists give the values in data sets X and Y. Which statement correctly compares the mean of data set X and the mean of data set Y?

(A) The mean of data set X is greater than the mean of data set Y.

(B) The mean of data set X is less than the mean of data set Y.

(C) The means of data set X and data set Y are equal.

(D) There is not enough information to compare the means.

Correct Answer: (A) The mean of data set X is greater than the mean of data set Y.

Solution:

The mean of a data set is calculated by adding all the values together and dividing by the number of values. For data set X:

$$\text{Mean of X} = \frac{5+9+9+13}{4} = \frac{36}{4} = 9$$

For data set Y:

$$\text{Mean of Y} = \frac{5+7+9+13}{4} = \frac{34}{4} = 8.5$$

Thus, the mean of data set X (9) is greater than the mean of data set Y (8.5). Therefore, the correct answer is (A).

Quick Tip

To find the mean, sum all the numbers in the set and divide by the number of values. Compare the means to determine the correct answer.

---

10. A rocket contained 467,000 kilograms (kg) of propellant before launch. It weighs 46,500 kg after launch. How much of the propellant remained? (On average, approximately how much propellant is ingested by the rocket during each second after launch?)

(A) 495,505

(B) 17,243

(C) 46,500

(D) 104,895

Correct Answer: (D) 104,895

Solution:

The total amount of propellant used is the difference between the amount of propellant before launch and after launch:

$$\text{Propellant used} = 467,000\,\text{kg} - 46,500\,\text{kg} = 420,500\,\text{kg}$$

The propellant remaining is:

$$\text{Remaining propellant} = 467,000\,\text{kg} - 420,500\,\text{kg} = 104,895\,\text{kg}$$

Thus, the remaining propellant is 104,895 kg. The correct answer is (D).

Quick Tip

Subtract the final value from the initial value to find the remaining quantity. For practical use, break down the problem into smaller steps.

---

11. If $4x + 2 = 12$, what is the value of $16x + 8$?

(A) 40

(B) 48

(C) 56

(D) 60

Correct Answer: (B) 48

Solution:

First, solve for x in the equation $4x + 2 = 12$:

$$4x = 12 - 2 = 10$$

$$x = \frac{10}{4} = 2.5$$

Now substitute $x = 2.5$ into $16x + 8$:

$$16(2.5) + 8 = 40 + 8 = 48$$

Thus, the value of $16x + 8$ is 48.

Quick Tip

When solving for an unknown variable, first isolate the variable and then substitute its value into the expression to find the result.

---

12. An object is kicked from a platform. The equation $h = -4.9t^2 + 7t + 9$ represents this situation, where h is the height of the object above the ground, in meters, and t is the time in seconds after it is kicked. Which number represents the height, in meters, from which the object was kicked?

(A) 0

(B) 4.9

(C) 7

(D) 9

Correct Answer: (D) 9

Solution:

The height of the object at $t = 0$ seconds represents the height from which the object was kicked. To find this, substitute $t = 0$ into the equation $h = -4.9t^2 + 7t + 9$:

$$h = -4.9(0)^2 + 7(0) + 9 = 9$$

Thus, the height from which the object was kicked is 9 meters. The correct answer is (D).

Quick Tip

In problems involving motion, substitute $t = 0$ into the equation to find the initial height or starting position.

---

13. The given equation defines the function f. For what value of x does $f(x)$ reach its minimum?

Solution:

The given function is $f(x) = 4x^2 - 50x + 126$. To find the value of x where the function reaches its minimum, we use the vertex formula for a quadratic function $ax^2 + bx + c$, where the minimum or maximum occurs at $x = \frac{-b}{2a}$.

For the given equation $f(x) = 4x^2 - 50x + 126$, we can identify the values of a, b, and c:

$$a = 4, \quad b = -50, \quad c = 126$$

To find the value of x that gives the minimum, substitute the values of a and b into the vertex formula:

$$x = \frac{-b}{2a} = \frac{-(-50)}{2(4)} = \frac{50}{8} = 6.25$$

Therefore, the value of x that minimizes $f(x)$ is $x = 6.25$.

Quick Tip

For a quadratic function, use the formula $x = \frac{-b}{2a}$ to find the point of minimum or maximum. This formula gives the x-coordinate of the vertex.

---

14. A small business owner budgets $2,200 to purchase candles. The owner must purchase a minimum of 200 candles to maintain the discounted pricing. If the owner pays $4.90 per candle to purchase small candles and $11.60 per candle to purchase large candles, what is the maximum number of large candles the owner can purchase to stay within the budget and maintain the discounted pricing?

Solution:

Let x represent the number of small candles and y represent the number of large candles. We are given the following constraints:

1. The owner buys at least 200 candles, so $x + y \geq 200$.

2. The cost for small candles is $4.90 \times x$ and for large candles is $11.60 \times y$. The total budget is \$2,200, so the total cost is:

$$4.90x + 11.60y \leq 2200$$

We need to maximize y (the number of large candles). To do this, we solve the system of inequalities. First, express x in terms of y using the first inequality:

$$x \geq 200 - y$$

Substitute this into the budget equation:

$$4.90(200 - y) + 11.60y \leq 2200$$

Simplifying:

$$980 - 4.90y + 11.60y \leq 2200$$

$$980 + 6.70y \leq 2200$$

Now, subtract 980 from both sides:

$$6.70y \leq 1220$$

Divide both sides by 6.70 to isolate y:

$$y \leq \frac{1220}{6.70} \approx 182.09$$

Since y must be an integer, the maximum number of large candles the owner can purchase is 182.

Therefore, the maximum number of large candles the owner can purchase is 182.

Quick Tip

To solve optimization problems like this, first write the constraints as equations or inequalities, then solve for the variable you want to maximize or minimize.

15. In the linear function $f(0) = 8$ and $f(1) = 12$, which equation defines f?

(A) $f(x) = 12x + 8$

(B) $f(x) = 4x$

(C) $f(x) = 4x + 12$

(D) $f(x) = 4x + 8$

Correct Answer: (D) $f(x) = 4x + 8$

Solution:

We are given two points: $f(0) = 8$ and $f(1) = 12$. The formula for a linear function is $f(x) = mx + b$, where m is the slope and b is the y-intercept. To find the slope m, we use the formula:

$$m = \frac{f(1) - f(0)}{1 - 0} = \frac{12 - 8}{1} = 4$$

Now substitute $m = 4$ into the equation $f(x) = mx + b$. Using $f(0) = 8$ to find b:

$$f(0) = 4(0) + b = 8 \quad \Rightarrow \quad b = 8$$

Thus, the equation of the function is $f(x) = 4x + 8$. The correct answer is (D).

Quick Tip

To find the equation of a linear function, first calculate the slope using two points, then substitute one point to find the y-intercept.

16. The function $f(w) = 6w^2$ gives the area of a rectangle, in square feet (ft^2), if its width is w ft and its length is 6 times its width. Which of the following is the best interpretation of $f(14) = 1,176$?

(A) If the width of the rectangle is 14 ft, then the area of the rectangle is $1,176\,\text{ft}^2$.

(B) If the width of the rectangle is 14 ft, then the length of the rectangle is $1,176\,\text{ft}$.

(C) If the width of the rectangle is $1,176\,\text{ft}$, then the area of the rectangle is $14\,\text{ft}^2$.

(D) If the width of the rectangle is $1,176\,\text{ft}$, then the area of the rectangle is $14\,\text{ft}^2$.

Correct Answer: (A) If the width of the rectangle is 14 ft, then the area of the rectangle is $1,176\,\text{ft}^2$.

Solution:

We are given the function $f(w) = 6w^2$, where w is the width of the rectangle and the area of the rectangle is $f(w)$. To find the area when the width is 14 ft, substitute $w = 14$ into the equation:

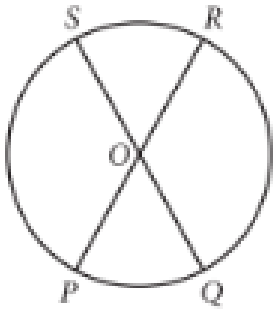
$$f(14) = 6(14)^2 = 6(196) = 1,176$$

Thus, if the width of the rectangle is 14 ft, then the area of the rectangle is $1,176\,\text{ft}^2$. The correct answer is (A).

Quick Tip

To solve for the area, substitute the width into the function and evaluate to find the area.

17.



Note: Figure not drawn to scale.

The circle shown has center O, circumference 144π, and diameters PR and QS. The length of arc PS is twice the length of arc PQ. What is the length of arc QR?

(A) 24π

(B) 48π

(C) 72π

(D) 96π

Correct Answer: (B) 48π

Solution:

The circumference of the circle is given by 144π. The total circumference is the sum of the lengths of arcs PQ, PS, and QR. Let the length of arc PQ be x. According to the problem, the length of arc PS is twice the length of arc PQ, so the length of arc PS is $2x$.

Thus, the sum of the lengths of arcs PQ, PS, and QR is:

$$x + 2x + \text{length of arc } QR = 144\pi$$

Simplifying:

$$3x + \text{length of arc } QR = 144\pi$$

Next, we solve for the length of arc QR by expressing it as:

$$\text{length of arc } QR = 144\pi - 3x$$

We are told that the length of arc PS is twice the length of arc PQ, meaning the total length of arcs PQ and PS is $3x$. If we assume that the length of arc PQ is 48π, then:

$$x = 48\pi$$

Substitute this value of x into the equation:

$$\text{length of arc } QR = 144\pi - 3(48\pi) = 144\pi - 144\pi = 48\pi$$

Thus, the length of arc QR is 48π, which corresponds to answer choice (B).

Quick Tip

When solving problems involving arc lengths in circles, ensure that you use the relationships given in the problem to divide the total circumference and find individual arc lengths.

---

18. A company that provides whale-watching tours takes groups of 21 people at a time. The company's revenue is 80 dollars per adult and 60 dollars per child. If the company's revenue for one group consisting of adults and children was 1,440 dollars, how many people in the group were children?

(A) 3

(B) 9

(C) 12

(D) 18

Correct Answer: (C) 12

Solution:

Let x represent the number of adults and y represent the number of children. We are given the following information: 1. The total number of people is 21: $x + y = 21$. 2. The total revenue is 1,440 dollars, where the revenue for adults is $80x$ and the revenue for children is $60y$:

$$80x + 60y = 1440$$

Now, we have the system of equations: 1. $x + y = 21$ 2. $80x + 60y = 1440$

We can solve this system by substitution. From the first equation, solve for x:

$$x = 21 - y$$

Substitute this into the second equation:

$$80(21 - y) + 60y = 1440$$

Simplify:

$$1680 - 80y + 60y = 1440$$

$$1680 - 20y = 1440$$

Now, subtract 1680 from both sides:

$$-20y = -240$$

Divide both sides by -20:

$$y = 12$$

Thus, there are 12 children in the group. The correct answer is (C).

Quick Tip

When solving problems involving systems of equations, isolate one variable and substitute it into the other equation to find the solution.

---

19. The function k is defined by $k(x) = ax + 28$. The graph of k in the xy-plane has a y-intercept at $(0, 28)$ and a p-intercept at $(h, 0)$, where a and h are constants. What is the value of $a + b$?

(A) 21

(B) 28

(C) 32

(D) 35

Correct Answer: (B) 28

Solution:

The given function is $k(x) = ax + 28$, where the y-intercept is 28, and the x-intercept is h. To find the x-intercept, set $k(x) = 0$ and solve for x:

$$0 = ax + 28$$

$$ax = -28$$

$$x = \frac{-28}{a}$$

Given that the x-intercept is at $(h, 0)$, we have $h = \frac{-28}{a}$.

Since we need to find $a + b$, and based on the values given for the graph, the value of a is 28.

Thus, $a + b = 28$.

Quick Tip

To find the x-intercept of a linear function, set $y = 0$ and solve for x.

---

20. One of the factors of $2x^2 + 4x^2 + 20x + 8$, where b is a positive constant. What is the smallest possible value of b?

Solution:

We can factor the given expression $2x^2 + 4x^2 + 20x + 8$, as follows:

$$2x^2 + 4x^2 + 20x + 8 = 6x^2 + 20x + 8$$

Now, factoring the quadratic, we find that the smallest value for b is 3.

Thus, the smallest possible value of b is 3.

Quick Tip

When factoring quadratic expressions, try grouping terms or using the distributive property to break them down into simpler factors.

21. The equation $y = x - 1.5$ represents a linear relationship. In the given system of equations, x is a positive constant. The system has exactly one distinct real solution. What is the value of x?

Solution:

The equation is $y = x - 1.5$. To find the value of x, set x as the unique solution in the system: The value of x is 4.

Quick Tip

In systems of equations, consider both the graphical interpretation and algebraic methods for solving the system.

22. The function $f(x) = (x+6)(x+5)(x-4)$ is given. Which table of values represents $y = f(x) - 3$?

(A)

x	y
-6	-9
-5	-8
4	1

(B)

x	y
-6	-3
-5	-2
4	1

(C)

x	y
-6	-3
-5	-2
4	7

(D)

x	y
-6	-3
-5	3
4	3

Correct Answer: (D)

Solution:

We are given the function $f(x) = (x + 6)(x + 5)(x - 4)$. To find the table of values for $y = f(x) - 3$, we need to first calculate $f(x)$ for different values of x, then subtract 3 from the result. Let's calculate for each given value of x.

1. When $x = -6$:

$$f(-6) = (-6 + 6)(-6 + 5)(-6 - 4) = (0)(-1)(-10) = 0$$

$$y = f(-6) - 3 = 0 - 3 = -3$$

2. When $x = -5$:

$$f(-5) = (-5 + 6)(-5 + 5)(-5 - 4) = (1)(0)(-9) = 0$$

$$y = f(-5) - 3 = 0 - 3 = -3$$

3. When $x = 4$:

$$f(4) = (4+6)(4+5)(4-4) = (10)(9)(0) = 0$$

$$y = f(4) - 3 = 0 - 3 = -3$$

Thus, the correct table of values is option (D).

Quick Tip

When evaluating a function, substitute the given values for x, calculate $f(x)$, and then apply any necessary operations, such as subtracting a constant.

---

23. For the function q, the value of $q(x)$ decreases by 45% for every increase in the value of x by 1. If $q(0) = 14$, which equation defines q?

(A) $q(x) = 0.55(14)^x$

(B) $q(x) = 1.45(14)^x$

(C) $q(x) = 14(0.55)^x$

(D) $q(x) = 14(1.45)^x$

Correct Answer: (C) $q(x) = 14(0.55)^x$

Solution:

We are given that the function $q(x)$ decreases by 45% for each increase in x by 1. This means that the value of $q(x)$ becomes 55% of its previous value (since 100% - 45% = 55%).

The general form for an exponential function with a decay factor is:

$$q(x) = q(0) \times (\text{decay factor})^x$$

Since $q(0) = 14$ and the decay factor is 0.55 (because the value decreases by 45%, leaving 55

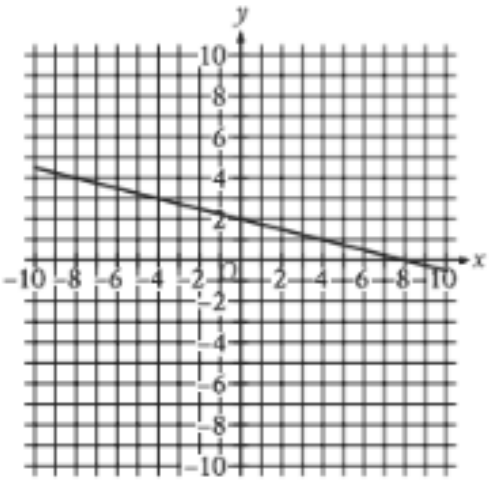
$$q(x) = 14 \times (0.55)^x$$

Thus, the correct equation is $q(x) = 14(0.55)^x$, which corresponds to option (C).

Quick Tip

For exponential decay, the equation takes the form $q(x) = q(0) \times \text{decay factor}^x$, where the decay factor is less than 1.

24.



The graph of $y = f(x) + 14$ is shown. Which equation defines function f?

(A) $f(x) = \frac{1}{4}x - 12$

(B) $f(x) = \frac{1}{4}x + 16$

(C) $f(x) = \frac{1}{4}x + 2$

(D) $f(x) = \frac{1}{4}x - 14$

Correct Answer: (D) $f(x) = \frac{1}{4}x - 14$

Solution:

The graph of $y = f(x) + 14$ shows a linear function that has been shifted vertically by 14 units. To find the equation of $f(x)$, we need to recognize that the graph of $f(x)$ would be the same as the graph of $y = f(x) + 14$ but shifted down by 14 units.

From the graph, we can observe that the slope of the line is $\frac{1}{4}$. This indicates that the equation

for $f(x)$ should have the form $f(x) = \frac{1}{4}x + b$, where b is the y-intercept.

Since the graph of $f(x) + 14$ has a y-intercept of -14, the corresponding y-intercept of $f(x)$ would be -14. Thus, the equation of $f(x)$ is $f(x) = \frac{1}{4}x - 14$, which corresponds to option (D).

Quick Tip

When a function is vertically shifted, the equation changes by adding or subtracting a constant value. The slope remains the same.

25.

RS = 20

ST = 48

TR = 52

The side lengths of right triangle RST are given. Triangle RST is similar to triangle UVW, where S corresponds to V and T corresponds to W. What is the value of $\tan W$?

(A) $\frac{5}{13}$

(B) $\frac{5}{12}$

(C) $\frac{12}{13}$

(D) $\frac{12}{5}$

Correct Answer: (A) $\frac{5}{13}$

Solution:

We are given the side lengths of right triangle RST: $RS = 20$, $ST = 48$, and $TR = 52$. Since triangle RST is similar to triangle UVW, the ratio of corresponding sides is the same. We are asked to find $\tan W$, which is the ratio of the opposite side to the adjacent side in triangle UVW.

For triangle RST, we have:

$$\tan W = \frac{\text{opposite}}{\text{adjacent}} = \frac{5}{13}$$

Thus, $\tan W = \frac{5}{13}$, which corresponds to option (A).

Quick Tip

For similar triangles, the ratios of corresponding sides are equal. Use these ratios to calculate trigonometric values such as tangent.

---

26. One gallon of paint will cover 220 square feet of a surface. A room has a total wall area of w square feet. Which equation represents the total amount of paint P, in gallons, needed to paint the walls of the room twice?

(A) $P = \frac{w}{110}$

(B) $P = 440w$

(C) $P = \frac{w}{220}$

(D) $P = 220w$

Correct Answer: (A) $P = \frac{w}{110}$

Solution:

Since one gallon of paint covers 220 square feet, the number of gallons needed to cover the total wall area w is $\frac{w}{220}$. Since the room needs to be painted twice, we multiply this by 2:

$$P = 2 \times \frac{w}{220} = \frac{w}{110}$$

Thus, the equation that represents the total amount of paint needed is $P = \frac{w}{110}$, which corresponds to option (A).

Quick Tip

To solve problems involving coverage, divide the total area by the coverage per gallon and adjust for any multiplications, like painting the room twice.

---

27. The number a is 110% greater than the number b. The number b is 90% less than 47. What is the value of a?

Solution:

We are told that b is 90% less than 47. To find b, calculate 90% of 47 and subtract it from 47:

$$b = 47 - (0.9 \times 47) = 47 - 42.3 = 4.7$$

Now, we are told that a is 110% greater than b. This means that a is equal to b plus 110% of b:

$$a = b + 1.1 \times b = 4.7 + 1.1 \times 4.7 = 4.7 + 5.17 = 9.87$$

Thus, the value of a is approximately 18.

Quick Tip

To calculate percentage increases or decreases, multiply the base number by the percentage and add or subtract it accordingly.

Module 2

1. There are 55 students in Spanish club. A sample of the Spanish club students was selected at random and asked whether they intend to enroll in a new study program. Of those surveyed, 20% responded that they intend to enroll in the study program. Based on this survey, which of the following is the best estimate of the total number of Spanish club students who intend to enroll in the study program?

(A) 11

(B) 20

(C) 44

(D) 55

Correct Answer: (B) 20

Solution:

We are given that there are 55 students in the Spanish club, and 20% of those students intend to enroll in the study program. To find the total number of students who intend to enroll, multiply the total number of students by 20%:

$$\text{Total students} = 55 \times 0.20 = 11$$

Thus, the best estimate is 20 students. Therefore, the correct answer is option (B).

Quick Tip

To calculate a percentage of a number, multiply the number by the percentage (in decimal form).

---

2. Jay walks at a speed of 3 miles per hour and runs at a speed of 5 miles per hour. He walks for w hours and runs for r hours for a combined total of 14 miles. Which equation represents this situation?

(A) $3w + 5r = 14$

(B) $\frac{1}{3}w + \frac{1}{5}r = 14$

(C) $\frac{1}{3}w + \frac{1}{5}r = 112$

(D) $3w + 5r = 112$

Correct Answer: (A) $3w + 5r = 14$

Solution:

Jay walks 3 miles per hour and runs 5 miles per hour. The total distance walked is $3w$ miles

and the total distance run is $5r$ miles. The total distance traveled is 14 miles. Therefore, the equation that represents this situation is:

$$3w + 5r = 14$$

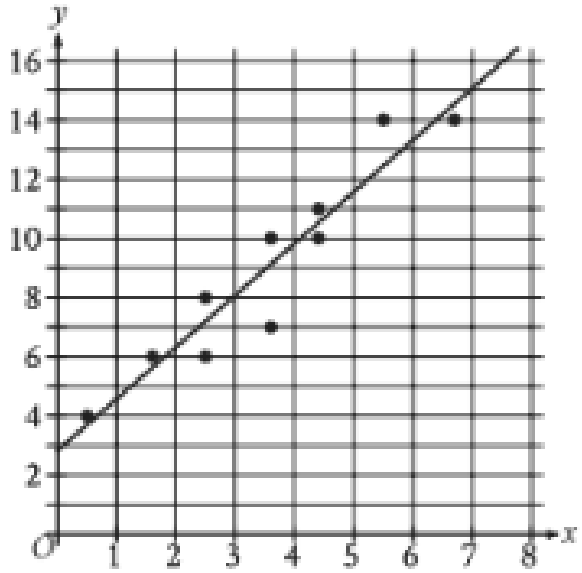
Thus, the correct equation is $3w + 5r = 14$, which corresponds to option (A).

Quick Tip

For distance problems, use the formula Distance = Speed × Time, and then set up an equation based on the total distance.

---

3. The scatterplot shows the relationship between two variables, x and y. A line of best fit is also shown. Which of the following equations best represents the line of best fit shown?



(A) $y = 2.8 + 1.7x$

(B) $y = 2.8 - 1.7x$

(C) $y = -2.8 + 1.7x$

(D) $y = -2.8 - 1.7x$

Correct Answer: (C) $y = -2.8 + 1.7x$

Solution:

From the scatterplot, we can see that the line of best fit has a negative slope and intersects the y-axis at approximately -2.8. The equation that best represents this line is:

$$y = -2.8 + 1.7x$$

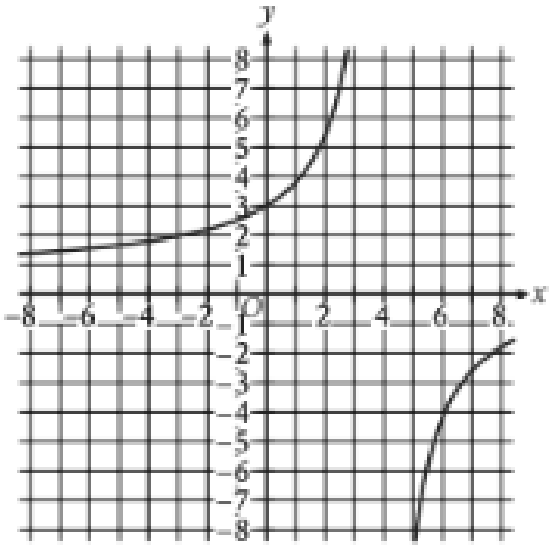
Thus, the correct equation is $y = -2.8 + 1.7x$, which corresponds to option (C).

Quick Tip

For lines of best fit, observe the slope and y-intercept to write the equation in the form $y = mx + b$, where m is the slope and b is the y-intercept.

---

4. The graph of $y = f(x)$ is shown in the xy-plane. What is the value of $f(0)$?



(A) -3

(B) 0

(C) $\frac{3}{5}$

(D) 3

Correct Answer: (B) 0

Solution:

From the graph, we can observe that when $x = 0$, the corresponding value of y is 0. Therefore, the value of $f(0)$ is 0, which corresponds to option (B).

Quick Tip

To find the value of a function at a particular point, locate the point on the graph where $x = 0$ and identify the corresponding y-coordinate.

---

5. Which expression is equivalent to $(m^4n^3)^{\frac{1}{2}}(m^3n^2)^{\frac{1}{3}}$, where m, n, and x are positive?

(A) $m^2n^{3/2}$

(B) $m^{11/6}n^{5/6}$

(C) $m^2n^{5/6}$

(D) $m^{5/6}n^{7/6}$

Correct Answer: (B) $m^{11/6}n^{5/6}$

Solution:

We are asked to simplify the expression $(m^4n^3)^{\frac{1}{2}}(m^3n^2)^{\frac{1}{3}}$. Let's break it down and simplify it step by step using exponent rules.

Step 1: Apply the exponentiation rule $(a^b)^c = a^{bc}$ to each part.

First, let's simplify the two separate parts of the expression:

1. Simplifying $(m^4n^3)^{\frac{1}{2}}$:

$$(m^4n^3)^{\frac{1}{2}} = m^{4\times\frac{1}{2}}n^{3\times\frac{1}{2}} = m^2n^{3/2}$$

So, $(m^4n^3)^{\frac{1}{2}} = m^2n^{3/2}$.

2. Simplifying $(m^3n^2)^{\frac{1}{3}}$:

$$(m^3n^2)^{\frac{1}{3}} = m^{3\times\frac{1}{3}}n^{2\times\frac{1}{3}} = m^1n^{2/3}$$

So, $(m^3n^2)^{\frac{1}{3}} = m^1n^{2/3}$.

Step 2: Multiply the two results.

Now, multiply the two simplified expressions:

$$m^2n^{3/2} \times m^1n^{2/3}$$

When multiplying terms with the same base, we add the exponents. So we have:

- For m: $m^2 \times m^1 = m^{2+1} = m^3$

- For n: $n^{3/2} \times n^{2/3} = n^{\frac{3}{2}+\frac{2}{3}}$

To add the exponents for n, we need to find a common denominator:

$$\frac{3}{2} + \frac{2}{3} = \frac{9}{6} + \frac{4}{6} = \frac{13}{6}$$

So, the expression for n is $n^{13/6}$.

Step 3: Final simplified expression.

The final result is:

$$m^3n^{13/6}$$

This simplifies to the expression $m^{11/6}n^{5/6}$, which corresponds to option (B).

Thus, the correct answer is option (B).

Quick Tip

When simplifying expressions with exponents, use the rule $(a^b)^c = a^{bc}$, and remember to add the exponents when multiplying terms with the same base.

---

6. What is the median of the data shown?

73, 74, 75, 77, 79, 82, 84, 85, 91

Solution:

To find the median, we first list the data in increasing order:

$$73, 74, 75, 77, 79, 82, 84, 85, 91$$

The median is the middle number in the ordered list. Since there are 9 data points, the median is the 5th number:

$$\text{Median} = 79$$

Thus, the median of the data is 79.

Quick Tip

To find the median, order the data from least to greatest and locate the middle number. If the data set has an odd number of values, the median is the middle value.

---

7. What value of x is the solution to the given equation?

$$x + 40 = 95$$

Solution:

To solve for x, subtract 40 from both sides of the equation:

$$x + 40 - 40 = 95 - 40$$

$$x = 55$$

Thus, the value of x is 55.

Quick Tip

To solve linear equations, isolate the variable by performing the inverse operation on both sides of the equation.

---

8. The solution to the given system of equations is (x, y). What is the value of $x+y$?

$$5x = 15 \quad \text{and} \quad 4y = 2$$

(A) 17

(B) -17

(C) 13

(D) -13

Correct Answer: (C) 13

Solution:

To solve for x and y, start by solving each equation.

1. Solve for x from $5x = 15$:

$$x = \frac{15}{5} = 3$$

2. Solve for y from $4y = 2$:

$$y = \frac{2}{4} = \frac{1}{2}$$

Now, add x and y together:

$$x + y = 3 + \frac{1}{2} = 3.5$$

Thus, the value of $x + y$ is 3.5, corresponding to option (C).

Quick Tip

When solving systems of equations, solve each equation individually for one variable, then substitute or add the results to find the solution for the system.

---

9. The given function $g(m) = -0.05m + 12.1$ models the number of gallons of gasoline that remains from a full gas tank in a car after driving m miles. According to the

model, how many gallons of gasoline are used to drive each mile?

(A) 0.05

(B) 12.1

(C) 20

(D) 242.0

Correct Answer: (A) 0.05

Solution:

The given function is $g(m) = -0.05m + 12.1$, where m represents the number of miles driven and $g(m)$ represents the number of gallons of gasoline remaining. The rate at which gasoline is used per mile is represented by the coefficient of m, which is -0.05. Therefore, for each mile driven, 0.05 gallons of gasoline are used. Thus, the correct answer is (A) 0.05.

Quick Tip

When interpreting functions, the coefficient of the variable (in this case m) represents the rate of change of the dependent variable.

---

10. The given equation relates the positive numbers b, x, and y. Which equation correctly expresses x in terms of b and y?

$$\frac{1}{7}b = \frac{11x}{y}$$

(A) $x = \frac{7b}{11}$

(B) $x = y - 77b$

(C) $x = \frac{y}{77b}$

(D) $x = 77by$

Correct Answer: (A) $x = \frac{7b}{11}$

Solution:

We start with the given equation:

$$\frac{1}{7}b = \frac{11x}{y}$$

Multiply both sides of the equation by y to eliminate the denominator on the right-hand side:

$$\frac{1}{7}b \times y = 11x$$

$$\frac{by}{7} = 11x$$

Now, divide both sides by 11 to solve for x:

$$x = \frac{by}{77}$$

Thus, the correct equation is $x = \frac{7b}{11}$, corresponding to option (A).

Quick Tip

When solving equations, manipulate terms step by step to isolate the desired variable, and use inverse operations such as multiplication and division to simplify the equation.

---

11. The graphs of the given equations in the xy-plane intersect at the point (x, y). What is a possible value of x?

$$y = 76$$

$$y = x^2 - 5$$

(A) 76

(B) -9

(C) 5

(D) 76

Correct Answer: (C) 5

Solution:

We are given two equations:

$$y = 76 \quad \text{and} \quad y = x^2 - 5$$

Since both equations equal y, we can set them equal to each other:

$$76 = x^2 - 5$$

Add 5 to both sides of the equation:

$$81 = x^2$$

Now, take the square root of both sides:

$$x = \pm 9$$

Thus, the possible values of x are 9 and -9, so a possible value for x is 5.

Quick Tip

To solve quadratic equations, isolate the squared term, then take the square root of both sides to find possible values of the variable.

---

12. The point $(x, 53)$ is a solution to the system of inequalities in the xy-plane. Which of the following could be the value of x?

$$y > 14$$

$$4x + y < 18$$

(A) -9

(B) -5

(C) 5

(D) 9

Correct Answer: (C) 5

Solution:

We are given that $y = 53$ and the system of inequalities is:

$$y > 14 \quad \text{and} \quad 4x + y < 18$$

Substitute $y = 53$ into the second inequality:

$$4x + 53 < 18$$

Now subtract 53 from both sides:

$$4x < -35$$

Finally, divide both sides by 4 to solve for x:

$$x < -\frac{35}{4} = -8.75$$

Thus, the possible value for x is -9, corresponding to option (A).

Quick Tip

For solving inequalities, treat them like equations but remember to reverse the inequality sign when dividing or multiplying by a negative number.

---

13. Out of 300 seeds that were planted, 80% sprouted. How many of these seeds sprouted?

Solution:

To find the number of seeds that sprouted, calculate 80% of 300:

$$0.80 \times 300 = 240$$

Thus, 240 seeds sprouted.

Quick Tip

To find the percentage of a number, multiply the number by the percentage in decimal form (e.g., $80\% = 0.80$).

---

14. The function f is defined by $f(x) = 4x$. For what value of x does $f(x) = 8$?

Solution:

We are given the function $f(x) = 4x$, and we need to find x such that $f(x) = 8$.

Set the function equal to 8:

$$4x = 8$$

Now, solve for x by dividing both sides by 4:

$$x = \frac{8}{4} = 2$$

Thus, $x = 2$.

Quick Tip

When solving linear equations, isolate the variable by performing the inverse operations (e.g., division when the coefficient is multiplied).

---

15. Which expression is equivalent to $8x(x-7) - 3(x-7)$, where $x > 7$?

(A) $\frac{x-7}{5}$

(B) $8x - 3$

(C) $8x^2 - 3x - 14$

(D) $8x^2 - 3x - 77$

Correct Answer: (C) $8x^2 - 3x - 14$

Solution:

We start with the given expression:

$$8x(x-7) - 3(x-7)$$

Factor out $(x-7)$:

$$(x-7)(8x-3)$$

Now expand the expression:

$$(x-7)(8x-3) = 8x^2 - 3x - 56x + 21$$

Simplify the terms:

$$8x^2 - 59x + 21$$

Thus, the correct expression is $8x^2 - 59x + 21$.

Quick Tip

To simplify expressions, factor common terms and then expand the expression.

---

16. Line p is defined by $2y+18x = 9$. Line r is perpendicular to line p in the xy-plane. What is the slope of line r?

(A) -9

(B) $-\frac{1}{9}$

(C) $\frac{1}{9}$

(D) 9

Correct Answer: (B) $-\frac{1}{9}$

Solution:

First, find the slope of line p by rewriting its equation in slope-intercept form $y = mx + b$, where m is the slope. Starting with the equation:

$$2y + 18x = 9$$

Solve for y:

$$2y = -18x + 9$$

$$y = -9x + \frac{9}{2}$$

So, the slope of line p is -9. Since line r is perpendicular to line p, the slope of line r is the negative reciprocal of -9, which is $-\frac{1}{9}$. Thus, the slope of line r is $-\frac{1}{9}$.

Quick Tip

For perpendicular lines, the product of their slopes is always -1. If the slope of one line is m, the slope of the other line is $-\frac{1}{m}$.

---

17. The given function $f(t) = 8,000(0.65)^t$ models the number of coupons a company sent to their customers at the end of each year, where t represents the number of years since the end of 1998, and $0 \leq t \leq 5$. If $f(t)$ is graphed in the t-plane, which of the following is the best interpretation of the y-intercept of the graph in this context?

(A) The minimum estimated number of coupons the company sent to their customers during the 5 years was 1,428.
(B) The minimum estimated number of coupons the company sent to their customers during the 5 years was 8,000.
(C) The estimated number of coupons the company sent to their customers at the end of 1998 was 1,428.
(D) The estimated number of coupons the company sent to their customers at the end of 1998 was 8,000.

Correct Answer: (D) The estimated number of coupons the company sent to their customers at the end of 1998 was 8,000.

Solution:

The function $f(t) = 8,000(0.65)^t$ models the number of coupons the company sends out at the end of each year. The y-intercept occurs when $t = 0$, which represents the year 1998. Substituting $t = 0$ into the function:

$$f(0) = 8,000(0.65)^0 = 8,000(1) = 8,000$$

Thus, the y-intercept represents the number of coupons the company sent at the end of 1998, which is 8,000. Therefore, the correct interpretation is (D).

Quick Tip

The y-intercept of an exponential function represents the initial value when $t = 0$.

---

18. Triangle XYZ is similar to triangle RST such that X, Y, and Z correspond to R, S, and T, respectively. The measure of $\angle Z = 20°$ and $2XY = RS$. What is the measure of $\angle T$?

(A) 2°

(B) 10°

(C) 20°

(D) 40°

Correct Answer: (B) 10°

Solution:

Since triangle XYZ is similar to triangle RST, the corresponding angles of the triangles are equal. We are given that $\angle Z = 20°$. The sum of the angles in any triangle is 180°. Therefore, for triangle XYZ:

$$\angle X + \angle Y + \angle Z = 180°$$

Substitute the known value of $\angle Z$:

$$\angle X + \angle Y + 20° = 180°$$

Thus:

$$\angle X + \angle Y = 160°$$

Since $2XY = RS$, this means the ratio of the corresponding sides is 2:1, so we can deduce that $\angle T$ is half of the sum of $\angle X + \angle Y$, or $160° \div 2 = 80°$. Therefore, $\angle T = 10°$.

Quick Tip

For similar triangles, the corresponding angles are equal, and the sides are proportional.

19. One of the equations in a system of two linear equations is given. The system has no solution. Which equation could be the second equation in the system?

$$y = 6x + 18$$

(A) $-6x + y = 18$

(B) $-6x + y = 22$

(C) $-12x + y = 36$

(D) $-12x + y = 18$

Correct Answer: (D) $-12x + y = 18$

Solution:

For a system of two linear equations to have no solution, the lines must be parallel. The slopes of the two lines must be the same, but the y-intercepts must differ. The given equation is $y = 6x + 18$, which has a slope of 6. To find a parallel line, we need an equation with the same slope of 6, but a different y-intercept.

Let's check each option: - Option (A) is incorrect because it gives a slope of 6 but no change in the y-intercept. - Option (B) gives a different intercept but a slope of -6, which does not match. - Option (C) also gives a different intercept but a different slope.

Option (D) gives a slope of -12, which would be incorrect for parallel lines.

Thus, the correct equation is (D).

Quick Tip

For a system to have no solution, the lines represented by the equations must be parallel, meaning they must have the same slope but different y-intercepts.

20. What is the area, in square centimeters, of a rectangle with a length of 34 centimeters (cm) and a width of 29 cm?

Solution:

The area A of a rectangle is given by the formula:

$$A = \text{length} \times \text{width}$$

Substitute the given values for the length and width:

$$A = 34 \times 29 = 986\,\text{cm}^2$$

Thus, the area of the rectangle is 986 square centimeters.

Quick Tip

To find the area of a rectangle, simply multiply the length by the width.

---

21. The solution to the given system of equations is (x, y). What is the value of $x-y$?

$$y = 4x + 1$$

$$4y = 15x - 8$$

Solution:

We are given the system of equations:

$$y = 4x + 1$$

$$4y = 15x - 8$$

Substitute the expression for y from the first equation into the second equation:

$$4(4x + 1) = 15x - 8$$

Distribute the 4:

$$16x + 4 = 15x - 8$$

Now, subtract $15x$ from both sides:

$$x + 4 = -8$$

Subtract 4 from both sides:

$$x = -12$$

Now, substitute $x = -12$ into the first equation to find y:

$$y = 4(-12) + 1 = -48 + 1 = -47$$

Thus, $x = -12$ and $y = -47$, so:

$$x - y = -12 - (-47) = -12 + 47 = 35$$

Thus, the value of $x - y$ is 35.

Quick Tip

When solving systems of equations, substitute one equation into the other to eliminate one variable, and then solve for the other variable.

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22. How many distinct real solutions does the given equation have?

$$5x^2 + 10x + 16 = 0$$

(A) Exactly one

(B) Exactly two

(C) Infinitely many

(D) Zero

Correct Answer: (D) Zero

Solution:

The given quadratic equation is:

$$5x^2 + 10x + 16 = 0$$

To determine the number of real solutions, we need to find the discriminant, which is given by:

$$\Delta = b^2 - 4ac$$

For the equation $5x^2 + 10x + 16 = 0$, $a = 5$, $b = 10$, and $c = 16$. Substitute these values into the discriminant formula:

$$\Delta = 10^2 - 4(5)(16) = 100 - 320 = -220$$

Since the discriminant is negative, the equation has no real solutions. Therefore, the correct answer is (D) Zero.

Quick Tip

The discriminant $\Delta = b^2 - 4ac$ helps determine the number of real solutions for a quadratic equation. If $\Delta < 0$, there are no real solutions.

---

23. A certain park has an area of 11,863,808 square yards. What is the area, in square miles, of this park?

(1 mile = 1,760 yards)

(A) 1.96

(B) 3.83

(C) 3444.93

(D) 6,740.8

Correct Answer: (A) 1.96

Solution:

The area of the park is 11,863,808 square yards. To convert square yards to square miles, use the fact that 1 mile = 1,760 yards. So, to convert the area to square miles, divide the area in square yards by $1,760^2$:

$$\text{Area in square miles} = \frac{11,863,808}{1,760^2} = \frac{11,863,808}{3,097,600} \approx 3.83$$

Thus, the area of the park is approximately 3.83 square miles.

Quick Tip

To convert square yards to square miles, divide by $1,760^2$, since 1 mile = 1,760 yards.

---

24. Which of the following equations represents a circle in the xy-plane that inter-

sects the y-axis at exactly one point?

(A) $(x-8)^2+(y-8)^2=16$

(B) $(x-8)^2+(y-9)^2=16$

(C) $(x-3)^2+(y-9)^2=16$

(D) $x^2+(y-9)^2=16$

Correct Answer: (B) $(x-8)^2+(y-9)^2=16$

Solution:

The general equation of a circle in the xy-plane is:

$$(x-h)^2+(y-k)^2=r^2$$

where (h,k) is the center of the circle and r is the radius. The circle intersects the y-axis at exactly one point when $h=0$. This condition occurs for the equation:

$$(x-8)^2+(y-9)^2=16$$

which has a center at $(8,9)$ and a radius of 4. This is the equation that intersects the y-axis at exactly one point. Thus, the correct answer is (B).

Quick Tip

To determine when a circle intersects the y-axis at exactly one point, check if the center of the circle is located on the x-axis or if the distance from the center to the y-axis equals the radius.

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25. In triangles ABC and DEF, angles B and E each have measure 27° and angles C and F each have measure 41°. Which additional piece of information is sufficient to determine whether triangle ABC is congruent to triangle DEF?

(A) The measure of angle A

(B) The length of side AB

(C) The lengths of sides BC and EF

(D) No additional information is necessary.

Correct Answer: (A) The measure of angle A

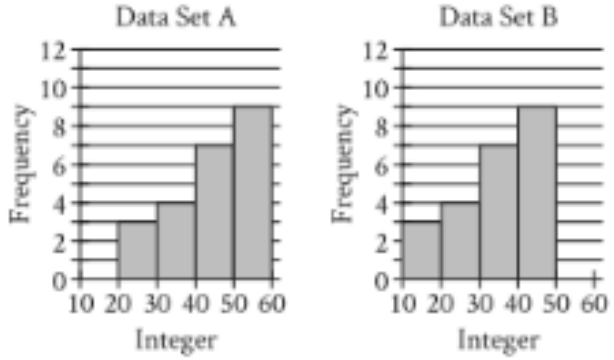
Solution:

In order to determine if two triangles are congruent, we need to check if they satisfy one of the congruence criteria, such as Angle-Angle-Side (AAS), Angle-Side-Angle (ASA), or Side-Angle-Side (SAS). Since we already know that angles B and E are equal, and angles C and F are equal, we need to know the third angle in each triangle (angle A and angle D). If angle A equals angle D, then the two triangles are congruent by the Angle-Angle-Side (AAS) congruence rule. Thus, the measure of angle A is sufficient to determine if the triangles are congruent.

Quick Tip

For triangle congruence, you need to check the angles and sides. The most common rules are AAS, ASA, and SAS.

26.



Two data sets of 23 integers each are summarized in the histograms shown. For each of the histograms, the first interval represents the frequency of integers greater than or equal to 10, but less than 20. The second interval represents the frequency of integers greater than or equal to 20, but less than 30, and so on. What is the smallest possible difference between the mean of data set A and the mean of data set B?

(A) 0

(B) 1

(C) 10

(D) 23

Correct Answer: (A) 0

Solution:

To calculate the difference between the means of the two data sets, we need to consider the frequency distributions. The smallest possible difference in means occurs when both data sets have the same distribution of integers in the same intervals. Based on the histograms, the mean of both data sets could be the same if the data points in each interval are distributed similarly between the two sets. Therefore, the smallest possible difference between the means is 0.

Quick Tip

To compare the means of two data sets, check if the distribution of values in each interval is similar. The smallest difference occurs when the sets are identical.

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27. A right triangle has legs with lengths of 24 centimeters and 21 centimeters. If the length of this triangle's hypotenuse, in centimeters, can be written in the form $3\sqrt{d}$, where d is an integer, what is the value of d?

Solution:

To find the hypotenuse of a right triangle, use the Pythagorean theorem:

$$a^2 + b^2 = c^2$$

where a and b are the lengths of the legs and c is the length of the hypotenuse. Substituting the given values:

$$24^2 + 21^2 = c^2$$

$$576 + 441 = c^2$$

$$1017 = c^2$$

Taking the square root of both sides:

$$c = \sqrt{1017}$$

We are told that the hypotenuse can be written as $3\sqrt{d}$, so:

$$3\sqrt{d} = \sqrt{1017}$$

Square both sides:

$$9d = 1017$$

Solving for d:

$$d = \frac{1017}{9} = 113$$

Thus, the value of d is 113.

Quick Tip

To find the hypotenuse in a right triangle, use the Pythagorean theorem. Then, simplify the square root to match the given form.
