SAT 2024 Practice Test 4 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. The spacecraft OSIRIS-REx briefly made contact with the asteroid 101955 Bennu in 2020. NASA scientist Daniella DellaGiustina reports that despite facing the unexpected obstacle of a surface mostly covered in boulders, OSIRIS-REx successfully ..... a sample of the surface, gathering pieces of it to bring back to Earth.

Which choice completes the text with the most logical and precise word or phrase?

(A) attached

(B) collected

(C) followed

(D) replaced

Correct Answer: (B) collected

Solution: The sentence talks about the spacecraft gathering pieces of the asteroid's surface, which is best described by the word "collected." "Attached," "followed," and "replaced" do not fit the context as well as "collected."

Quick Tip

When a sentence describes gathering or obtaining something, the verb "collect" is often the most appropriate choice.

2. Research conducted by planetary scientist Katarina Miljkovic suggests that the Moon's surface may not accurately ..... early impact events. When the Moon was still forming, its surface was softer, and asteroid or meteoroid impacts would have left less of an impression; thus, evidence of early impacts may no longer be present.

Which choice completes the text with the most logical and precise word or phrase?

(A) reflect

(B) receive

(C) evaluate

(D) mimic

Correct Answer: (A) reflect

Solution: The sentence implies that the Moon's surface would show signs of early impacts, making "reflect" the most suitable word to convey the idea of showing evidence. "Receive," "evaluate," and "mimic" do not fit the context as well as "reflect."

Quick Tip

"Reflect" is often used to describe the surface showing signs or evidence of something.

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3. Handedness, a preferential use of either the right or left hand, typically is easy to observe in humans. Because this trait is present but less ..... in many other animals, animal-behavior researchers often employ tasks specially designed to reveal individual animals' preferences for a certain hand or paw.

Which choice completes the text with the most logical and precise word or phrase?

(A) recognizable

(B) intriguing

(C) significant

(D) useful

Correct Answer: (C) significant

Solution: The sentence describes a trait that is less common in other animals, so "significant"

is the most logical word to describe the extent of its presence. "Recognizable," "intriguing," and "useful" are not as fitting in this context.

Quick Tip

When a trait is being compared in terms of frequency or importance, the word "significant" is often the most precise choice.

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4. It is by no means ..... to recognize the influence of Dutch painter Hieronymus Bosch on Ali Banisadr's paintings; indeed, Banisadr himself cites Bosch as an inspiration. However, some scholars have suggested that the ancient Mesopotamian poem Epic of Gilgamesh may have had a far greater impact on Banisadr's work. Which choice completes the text with the most logical and precise word or phrase?

(A) substantial

(B) satisfying

(C) unimportant

(D) appropriate

Correct Answer: (A) substantial

Solution: The sentence emphasizes the importance of recognizing the influence of Hieronymus Bosch, and "substantial" fits perfectly to highlight the weight of that recognition. "Satisfying," "unimportant," and "appropriate" do not convey the same level of emphasis.

Quick Tip

When discussing the importance or impact of something, "substantial" is often the most precise and appropriate term.

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5. The following text is adapted from Susan Glaspell's 1912 short story "Out There." An elderly shop owner is looking at a picture that he recently acquired and hopes to sell.

It did seem that the picture failed to fit in with the rest of the shop. A persuasive

young fellow who claimed he was closing out his stock let the old man have it for what he called a song. It was only a little out-of-the-way store which subsisted chiefly on the framing of pictures. The old man looked around at his views of the city, his pictures of cats and dogs, his flaming bits of landscape. "Don't belong in here," he fumed.

And yet the old man was secretly proud of his acquisition. There was a hidden dignity in his scowling as he shuffled about pondering the least ridiculous place for the picture.

Which choice best states the main purpose of the text?

(A) To reveal the shop owner's conflicted feelings about the new picture

(B) To convey the shop owner's resentment of the person he got the new picture from

(C) To describe the items that the shop owner most highly prizes

(D) To explain differences between the new picture and other pictures in the shop

Correct Answer: (A) To reveal the shop owner's conflicted feelings about the new picture

Solution: The text focuses on the elderly shop owner's conflicting feelings about the new picture, as he is both resentful and secretly proud of the acquisition. The other options do not align as well with the tone of the text.

Quick Tip

When analyzing a text for its main purpose, look for clues in the character's feelings and actions, as they often reveal the central theme.

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6. The following text is from the 1923 poem "Black Finger" by Angelina Weld Grimké, a Black American writer. A cypress is a type of evergreen tree.

I have just seen a most beautiful thing,

Slim and still,

Against a gold, gold sky,

A straight black cypress,

Sensitive,

Exquisite,

A black finger

Pointing upwards.

Why, beautiful still finger, are you black?

And why are you pointing upwards?

Which choice best describes the overall structure of the text?

(A) The speaker assesses a natural phenomenon, then questions the accuracy of her assessment

(B) The speaker describes a distinctive sight in nature, then ponders what meaning to attribute to that sight.

(C) The speaker presents an outdoor scene, then considers a human behavior occurring within that scene.

(D) The speaker examines her surroundings, then speculates about their influence on her emotional state.

Correct Answer: (B) The speaker describes a distinctive sight in nature, then ponders what meaning to attribute to that sight.

Solution: The poem begins by describing a beautiful sight (a cypress tree) and then questions its meaning, specifically why it is black and why it points upwards. This suggests that the correct option is (B).

Quick Tip

When analyzing a poem's structure, pay attention to how the speaker transitions from description to contemplation, as this can reveal the poem's thematic progression.

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7. The following text is from Walt Whitman's 1860 poem "Calamus 24."

I HEAR it is charged against me that I seek to

destroy institutions;

But really I am neither for nor against

institutions

(What indeed have I in common with them?—Or what with the destruction of them?),

Only I will establish in the Mannahatta
Manhattan

and in every city of These States,

inland and seaboard,

And in the fields and woods, and above every

keel [ship] little or large, that dents the water,

Without edifices, or rules, or trustees, or any

argument,

The institution of the dear love of comrades.

Which choice best describes the overall structure of the text?

(A) The speaker questions an increasingly prevalent attitude, then summarizes his worldview.

(B) The speaker regrets his isolation from others, then predicts a profound change in society.

(C) The speaker concedes his personal shortcomings, then boasts of his many achievements.

(D) The speaker addresses a criticism leveled against him, then announces a grand ambition of his.

Correct Answer: (A) The speaker questions an increasingly prevalent attitude, then summarizes his worldview.

Solution: The speaker begins by questioning the societal expectations placed upon him and then summarizes his own beliefs and vision for the future. Option (A) best captures this structure.

Quick Tip

When analyzing the structure of a poem, consider the way the speaker presents an initial idea or question followed by a statement of belief or action.

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8. The mimosa tree evolved in East Asia, where the beetle Bruchidius terrenus preys on its seeds. In 1785, mimosa trees were introduced to North America, far from any B. terrenus. But evolutionary links between predators and their prey can persist across centuries and continents. Around 2001, B. terrenus was introduced in southeastern North America where botanist Shu-Mei Chang and colleagues had been monitoring mimosa trees. Within a year, 93 percent of the trees had been attacked by the beetles.

Which choice best describes the function of the third sentence in the overall structure of the text?

(A) It states the hypothesis that Chang and colleagues had set out to investigate using mimosa trees and B. terrenus.

(B) It presents a generalization that is exemplified by the discussion of the mimosa trees and B. terrenus.

(C) It offers an alternative explanation for the findings of Chang and colleagues.

(D) It provides context that clarifies why the species mentioned spread to new locations.

Correct Answer: (D) It provides context that clarifies why the species mentioned spread to new locations.

Solution: The third sentence provides important context, explaining why the beetle was able to spread to North America and how this fits with the ongoing study by Chang and colleagues.

Quick Tip

When analyzing the function of a sentence in a passage, consider how it connects previous information and sets up the next portion of the narrative or argument.

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9. Text 1

Conventional wisdom long held that human social systems evolved in stages, beginning with hunter-gatherers forming small bands of members with roughly equal status. The shift to agriculture about 12,000 years ago sparked population growth that led to the emergence of groups with hierarchical structures: associations of clans first, then chiefdoms, and finally, bureaucratic states.

Text 2

In a 2021 book, anthropologist David Graeber and archaeologist David Wengrow maintain that humans have always been socially flexible, alternately forming systems based on hierarchy and collective ones with decentralized leadership. The authors point to evidence that as far back as 50,000 years ago some hunter-gatherers adjusted their social structures seasonally, at times dispersing in small groups but also assembling into communities that included esteemed individuals.

Based on the texts, how would Graeber and Wengrow (Text 2) most likely respond to the "conventional wisdom" presented in Text 1?

(A) By conceding the importance of hierarchical systems but asserting the greater significance of decentralized collective societies

(B) By disputing the idea that developments in social structures have followed a linear progression through distinct stages

(C) By acknowledging that hierarchical roles likely weren't a part of social systems before the rise of agriculture

(D) By challenging the assumption that groupings of hunter-gatherers were among the earliest forms of social structure

Correct Answer: (B) By disputing the idea that developments in social structures have followed a linear progression through distinct stages

Solution: Graeber and Wengrow argue against the linear progression of social structures and provide evidence that hunter-gatherer societies were more flexible and complex than traditionally thought. Option (B) is the most fitting response to the conventional wisdom.

Quick Tip

When analyzing a text's response to another argument, focus on the points where the authors question commonly held assumptions.

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10. The following text is adapted from Frances Hodgson Burnett's 1911 novel The Secret Garden. Mary, a young girl, recently found an overgrown hidden garden. Mary was an odd, determined little person, and now she had something interesting to be determined about, she was very much absorbed, indeed. She worked and dug and pulled up weeds steadily, only becoming more pleased with her work every hour instead of tiring of it. It seemed to her like a fascinating sort of play.

Which choice best states the main idea of the text?

(A) Mary hides in the garden to avoid doing her chores.

(B) Mary is getting bored with pulling up so many weeds in the garden.

(C) Mary is clearing out the garden to create a space to play.

(D) Mary feels very satisfied when she's taking care of the garden.

Correct Answer: (D) Mary feels very satisfied when she's taking care of the garden.

Solution: The passage focuses on Mary's growing satisfaction and enjoyment as she works in the garden, which makes option (D) the correct choice.

Quick Tip

Look for clues in the text that indicate the character's emotions or feelings, as this will often lead you to the main idea.

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11. The following text is from Ezra Pound's 1909 poem "Hymn III," based on the work of Marcantonio Flaminio.

As a fragile and lovely flower unfolds its gleaming
foliage on the breast of the fostering earth, if
the dew and the rain draw it forth;
So doth my tender mind flourish, if it be fed with the
sweet dew of the fostering spirit,
Lacking this, it beginneth straightway to languish,
even as a floweret born upon dry earth, if the
dew and the rain tend it not.

Based on the text, in what way is the human mind like a flower?

(A) It becomes increasingly vigorous with the passage of time.

(B) It draws strength from changes in the weather.

(C) It requires proper nourishment in order to thrive.

(D) It perseveres despite challenging circumstances.

Correct Answer: (C) It requires proper nourishment in order to thrive.

Solution: The poem compares the human mind to a flower, stating that the mind needs nourishment, like a flower needs dew and rain, to flourish. Option (C) fits this idea best.

Quick Tip

When analyzing a poem, focus on how the imagery of nature is used to describe the qualities of the human experience.

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12. The following text is adapted from Jack London's 1903 novel The Call of the Wild. Buck is a sled dog living with John Thornton in Yukon, Canada.

Thornton alone held [Buck]. The rest of mankind was as nothing. Chance travellers might praise or pet him; but he was could under it all, and from a too demonstrative man he would get up and walk away. When Thornton's partners, Hans and Pete, arrived on the long-expected raft, Buck refused to notice them till he learned they were close to Thornton; after that he tolerated them in a passive sort of way, accepting favors from them as though he favored them by accepting.

Which choice best states the main idea of the text?

(A) Buck has become less social since he began living with Thornton.

(B) Buck mistrusts humans and does his best to avoid them.

(C) Buck has been especially well liked by most of Thornton's friends.

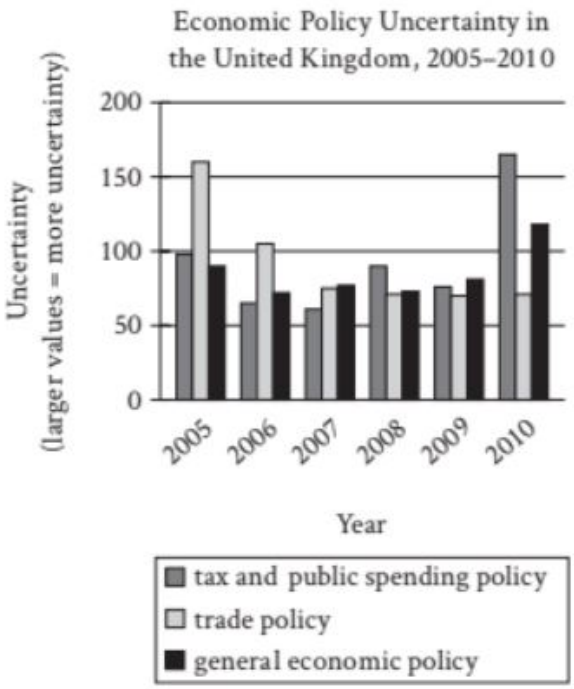
(D) Buck holds Thornton in higher regard than any other person.

Correct Answer: (D) Buck holds Thornton in higher regard than any other person.

Solution: The passage emphasizes how Buck only shows affection and trust towards Thornton, making option (D) the correct answer.

Quick Tip

Pay attention to how characters in literature express their emotions through actions, such as how Buck interacts with others in this passage.



13.

US States with the Greatest Number of Organic Farms in 2016 Organic farming is a method of growing food that tries to reduce environmental harm by using natural forms of pest control and avoiding fertilizers made with synthetic materials. Organic farms are still a small fraction of the total farms in the United States, but they have been becoming more popular. According to the US Department of Agriculture, in 2016 California had between 2,600 and 2,800 organic farms and .....

Which choice most effectively uses data from the graph to complete the text?

(A) Washington had between 600 and 800 organic farms.

(B) New York had fewer than 800 organic farms.

(C) Wisconsin and Iowa each had between 1,200 and 1,400 organic farms.

(D) Pennsylvania had more than 1,200 organic farms.

Correct Answer: (C) Wisconsin and Iowa each had between 1,200 and 1,400 organic farms.

Solution: The graph shows that Wisconsin and Iowa had around 1,200 to 1,400 organic farms, making option (C) the correct choice.

Quick Tip

When analyzing data from a graph, carefully check the numbers or ranges provided to ensure that the answer is consistent with the visual information.

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14. Biologist Valentina Gómez-Bahamón and her team have investigated two subspecies of the fork-tailed flycatcher bird that live in the same region in Colombia, but one subspecies migrates south for part of the year, and the other doesn't. The researchers found that, due to slight differences in feather shape, the feathers of migratory fork-tailed flycatcher males make a sound during flight that is higher pitched than that made by the feathers of nonmigratory males. The researchers hypothesize that fork-tailed flycatcher females are attracted to the specific sound made by the males of their own subspecies, and that over time the females' preference will drive further genetic and anatomical divergence between the subspecies. Which finding, if true, would most directly support Gómez-Bahamón and her team's hypothesis?

(A) The feathers located on the wings of the migratory fork-tailed flycatchers have a narrower shape than those of the nonmigratory birds, which allows them to fly long distances.

(B) Over several generations, the sound made by the feathers of migratory male fork-tailed flycatchers grows progressively higher pitched relative to that made by the feathers of nonmigratory males.

(C) Fork-tailed flycatchers communicate different messages to each other depending on whether their feathers create high-pitched or low-pitched sounds.

(D) The breeding habits of the migratory and nonmigratory fork-tailed flycatchers remained generally the same over several generations.

Correct Answer: (B) Over several generations, the sound made by the feathers of migratory male fork-tailed flycatchers grows progressively higher pitched relative to that made by the feathers of nonmigratory males.

Solution: The hypothesis is that females prefer the specific sound made by males of their own subspecies, which would lead to further divergence. Option (B) directly supports this idea by describing how the sound changes over generations.

Quick Tip

In hypothesis-based questions, focus on findings that directly address the proposed cause-and-effect relationships.

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15. Ablation Rates for Three Elements in Cosmic Dust, by Dust Source

Element	SPC	AST	HTC	OCC
iron	20%	28%	90%	98%
potassium	44%	74%	90%	100%
sodium	45%	75%	99%	100%

Earth's atmosphere is bombarded by cosmic dust originating from several sources: short-period comets (SPCs), particles from the asteroid belt (ASTs), Halley-type comets (HTCs), and Oort cloud comets (OCCs). Some of the dust's material vaporizes in the atmosphere in a process called ablation, and the faster the particles move, the higher the rate of ablation. Astrophysicist Juan Diego Carrillo-Sánchez led a team that calculated average ablation rates for elements in the dust (such as iron and potassium) and showed that material in slower-moving SPC or AST dust has a lower rate than the same material in faster-moving HTC or OCC dust. For example, whereas the average ablation rate for iron from AST dust is 28%, the average rate for .....

Which choice most effectively uses data from the table to complete the example?

(1) iron from SPC dust is 20%

(2) sodium from OCC dust is 100%

(3) iron from HTC dust is 90%

(4) sodium from AST dust is 75%

Correct Answer: (1) iron from SPC dust is 20%

Solution: The correct answer, option (1), is based on the data from the table, which shows that the ablation rate for iron from SPC dust is 20%.

Quick Tip

Always check the data in the table carefully, and choose the option that directly matches the values given in the question context.

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16. Art collectives, like the United States- and Vietnam-based collective The Propeller Group or Cuba's Los Carpinteros, are groups of artists who agree to work together: perhaps for stylistic reasons, or to advance certain shared political ideals, or to help mitigate the costs of supplies and studio space. Regardless of the reasons, art collectives usually involve some collaboration among the artists. Based on a recent series of interviews with various art collectives, an arts journalist claims that this can be difficult for artists who are often used to having sole control over their work.

Which quotation from the interviews best illustrates the journalist's claim?

(A) "The first collective I joined included many amazingly talented artists, and we enjoyed each other's company, but because we had a hard time sharing credit and responsibility for our work, the collective didn't last."

(B) "We work together, but that doesn't mean that individual projects are equally the work of all of us. Many of our projects are primarily the responsibility of whoever originally proposed the work to the group."

(C) "Having worked as a member of a collective for several years, it's sometimes hard to recall what it was like to work alone without the collective's support. But that support encourages my individual expression rather than limits it."

(D) "Sometimes an artist from outside the collective will choose to collaborate with us on a project, but all of those projects fit within the larger themes of the work the collective does on its own."

Correct Answer: (B) "We work together, but that doesn't mean that individual projects are equally the work of all of us. Many of our projects are primarily the responsibility of whoever originally proposed the work to the group."

Solution: This quotation addresses the difficulty of sharing credit and responsibility for work

in an art collective, which aligns with the journalist's claim about the challenges artists face in such collaborative environments.

Quick Tip

Pay attention to statements that directly discuss collaboration and individual roles within a group to identify answers that address the main idea of the passage.

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17. Effects of Mycorrhizal Fungi on 3 Plant Species

Plant species	**Mycorrhizal host**	**Average mass of plants grown in soil containing mycorrhizal fungi (in grams)**	**Average mass of plants grown in soil treated to kill fungi (in grams)**
Corn	yes	15.1	3.8
Marigold	yes	10.2	2.4
Broccoli	no	7.5	7.8

Mycorrhizal fungi in soil benefits many plants, substantially increasing the mass of some. A student conducted an experiment to illustrate this effect. The student chose three plant species for the experiment, including two that are mycorrhizal hosts (species known to benefit from mycorrhizal fungi) and one nonmycorrhizal species (a species that doesn't benefit from and may even be harmed by mycorrhizal fungi). The student then grew several plants from each species both in soil containing mycorrhizal fungi and in soil that had been treated to kill mycorrhizal and other fungi. After several weeks, the student measured the plants' average mass and was surprised to discover that

Which choice most effectively uses data from the table to complete the statement?

(A) broccoli grown in soil containing mycorrhizal fungi had a slightly higher average mass than broccoli grown in soil that had been treated to kill fungi.

(B) corn grown in soil containing mycorrhizal fungi had a higher average mass than broccoli

grown in soil containing mycorrhizal fungi.

(C) marigolds grown in soil containing mycorrhizal fungi had a much higher average mass than marigolds grown in soil that had been treated to kill fungi.

(D) corn had the highest average mass of all three species grown in soil that had been treated to kill fungi, while marigolds had the lowest.

Correct Answer: (A) broccoli grown in soil containing mycorrhizal fungi had a slightly higher average mass than broccoli grown in soil that had been treated to kill fungi.

Solution: From the data, we see that broccoli grown in soil with mycorrhizal fungi has an average mass of 7.5 grams, while the mass of broccoli grown in soil treated to kill fungi is 7.8 grams. This aligns with option (A), which indicates a slight difference, confirming this choice as the most appropriate answer.

Quick Tip

Carefully compare the values in the table, particularly those that show a small difference, to choose the most accurate answer.

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18. Several artworks found among the ruins of the ancient Roman city of Pompeii depict a female figure fishing with a cupid nearby. Some scholars have asserted that the figure is the goddess Venus, since she is known to have been linked with cupids in Roman culture, but University of Leicester archaeologist Carla Brain suggests that cupids may have also been associated with fishing generally. The fact that a cupid is shown near the female figure, therefore, _____

Which choice most logically completes the text?

(A) is not conclusive evidence that the figure is Venus.

(B) suggests that Venus was often depicted fishing.

(C) eliminates the possibility that the figure is Venus.

(D) would be difficult to account for if the figure is not Venus.

Correct Answer: (A) is not conclusive evidence that the figure is Venus.

Solution: The mention of a cupid near the female figure is not strong enough to confirm that the figure is Venus, as cupids could be associated with other subjects, including fishing. Therefore, this choice logically completes the text.

Quick Tip

Focus on reasoning that limits the interpretation based on the evidence provided, and avoid jumping to conclusions without solid evidence.

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19. Literary agents estimate that more than half of all nonfiction books credited to a celebrity or other public figure are in fact written by ghostwriters, professional authors who are paid to write other people's stories but whose names never appear on book covers.
Which choice completes the text so that it conforms to the conventions of Standard English?

(A) people's stories

(B) peoples story's

(C) peoples stories

(D) people's story's

Correct Answer: (A) people's stories

Solution: The correct answer is "people's stories" because the possessive form of "people" is "people's" (with the apostrophe before the "s"), and "stories" is plural, referring to multiple stories.

Quick Tip

Use the apostrophe for possession in terms like "people's" and make sure the plural form of the noun (stories) is used correctly.

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20. Like other amphibians, the wood frog (Rana sylvatica) is unable to generate its own heat, so during periods of subfreezing temperatures, it _____ by producing large amounts of glucose, a sugar that helps prevent damaging ice from forming inside its cells.

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

(A) had survived

(B) survived

(C) would survive

(D) survives

Correct Answer: (B) survived

Solution: The correct answer is "survived" because the sentence is discussing a general fact about the wood frog's survival mechanism during subfreezing temperatures. The simple past tense "survived" is appropriate here.

Quick Tip

When describing a general fact or habitual action, use the simple past tense, not the past perfect or conditional.

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21. After a spate of illnesses as a child, Wilma Rudolph was told she might never walk again. Defying all odds, Rudolph didn't just walk, she _____ the 1960 Summer Olympics in Rome, she won both the 100- and 200-meter dashes and clinched first place for her team in the 4×100-meter relay, becoming the first US woman to win three gold medals in a single Olympics.

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

(A) ran—fast—during

(B) ran—fast—during

(C) ran—fast, during

(D) ran—fast. During

Correct Answer: (A) ran—fast—during

Solution: The correct answer is "ran—fast—during" because the em dash emphasizes the adverbial phrase, correctly separating the modifier ("fast") from the action of running, and the word "during" connects the event and the action properly.

Quick Tip

When using em dashes to set off a modifier, make sure that it is placed correctly to ensure clarity and flow in the sentence.

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22. In many of her landscape paintings from the 1970s and 1980s, Lebanese American artist Etel Adnan worked to capture the essence of California's fog-shrouded Mount Tamalpais region through abstraction, using splotches of color to represent the area's features. Interestingly, the triangle representing the mountain itself _____ among the few defined figures in her paintings.

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

(A) are

(B) have been

(C) were

(D) is

Correct Answer: (D) is

Solution: The correct answer is "is" because the sentence discusses a general statement about the paintings, making the present tense appropriate. The sentence is describing the current

state of the triangle in the artist's work.

Quick Tip

Use the present tense when referring to facts or general observations, especially when discussing art or ongoing work.

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23. Seneca sculptor Marie Watt's blanket art comes in a range of shapes and sizes. In 2004, Watt sewed strips of blankets together to craft a 10-by-13-inch blanket, and in 2014, she arranged folded blankets into two large stacks and then cast them in bronze, creating two curving 18-foot-tall blue-bronze pillars.
Which choice completes the text so that it conforms to the conventions of Standard English?

(A) sampler later,

(B) sampler;

(C) sampler,

(D) sampler, later.

Correct Answer: (C) sampler,

Solution: The correct answer is "sampler," because the phrase "creating two curving 18-foot-tall blue-bronze pillars" is a nonessential clause explaining more about the object made from the sampler. Therefore, the comma correctly separates the nonessential information.

Quick Tip

When providing additional information about an item in a sentence, use a comma to separate nonessential clauses.

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24. African American Percy Julian was a scientist and entrepreneur whose work helped people around the world to see. Named in 1999 as one of the greatest

achievements by a US chemist in the past hundred years, _____ led to the first mass-produced treatment for glaucoma.

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

(A) Julian synthesized the alkaloid physostigmine in 1935; it

(B) in 1935 Julian synthesized the alkaloid physostigmine

(C) Julian's 1935 synthesis of the alkaloid physostigmine

(D) the alkaloid physostigmine was synthesized by Julian in 1935 and

Correct Answer: (B) in 1935 Julian synthesized the alkaloid physostigmine

Solution: The correct answer is "in 1935 Julian synthesized the alkaloid physostigmine" because the phrase appropriately introduces the information about the achievement and fits the syntactical structure of the sentence. The timing (1935) follows a chronological structure that leads to the primary action.

Quick Tip

When stating a historical achievement, ensure that the timing is properly integrated with the action to maintain clarity.

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25. The Arctic-Alpine Botanic Garden in Norway and the Jardim Botânico of Rio de Janeiro in Brazil are two of many botanical gardens around the world dedicated to growing diverse plant _____ fostering scientific research; and educating the public about plant conservation.

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

(A) species, both native and nonnative,

(B) species; both native and nonnative;

(C) species; both native and nonnative

(D) species both native and nonnative,

Correct Answer: (A) species, both native and nonnative,

Solution: The correct answer is "species, both native and nonnative," because the comma appropriately separates the elements of the list, keeping the sentence clear and grammatically correct.

Quick Tip

Use commas to separate items in a list, especially when clarifying additional information about them.

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26. Sociologist Alton Okinaka sits on the review board tasked with adding new sites to the Hawai'i Register of Historic Places, which includes Pi'ilanihale Heiau and the 'Opaeka'a Road Bridge. Okinaka doesn't make such decisions..... all historical designations must be approved by a group of nine other experts from the fields of architecture, archaeology, history, and Hawaiian culture.
Which choice completes the text so that it conforms to the conventions of Standard English?

(A) single-handedly, however

(B) single-handedly; however,

(C) single-handedly, however,

(D) single-handedly however

Correct Answer: (A) single-handedly, however

Solution: The correct answer is "single-handedly, however" because a comma appropriately separates the clauses, making the sentence grammatically correct and clear.

Quick Tip

Use commas to separate elements of a sentence, especially when introducing a contrasting element like "however."

---

27. In 1968, US Congressman John Conyers introduced a bill to establish a national holiday in honor of Dr. Martin Luther King Jr. The bill didn't make it to a vote, but Conyers was determined. He teamed up with Shirley Chisholm, the first Black woman to be elected to Congress, and they resubmitted the bill every session for the next fifteen years ..... in 1983, the bill passed.

Which choice completes the text with the most logical transition?

(A) Instead,

(B) Likewise,

(C) Finally,

(D) Additionally,

Correct Answer: (C) Finally,

Solution: The correct answer is "Finally" because it logically connects the events leading up to the passing of the bill after years of effort.

Quick Tip

When showing a final event or conclusion in a sequence, "Finally" is the most appropriate transition word.

---

28. Geoscientists have long considered Hawaii's Mauna Loa volcano to be Earth's largest shield volcano by volume, measuring approximately 74,000 cubic kilometers. ..... according to a 2020 study by local geoscientist Michael Garcia, Hawaii's Pāhalaunho shield volcano is significantly larger, boasting a volume of about 148,000 cubic kilometers.

Which choice completes the text with the most logical transition?

(1) Secondly

(2) Consequently

(3) Moreover

(4) However

Correct Answer: (4) However

Solution: The correct answer is "However" because it introduces a contrast between the initial statement about Mauna Loa and the new information about the Pāhalaunho volcano. "However" logically connects the two ideas, signaling that the second statement contradicts the first.

Quick Tip

Use "However" when introducing contrasting or opposing information in a sequence.

---

29. Samuel Coleridge-Taylor was a prominent classical music composer from England who toured the US three times in the early 1900s. The child of a West African father and an English mother, Coleridge-Taylor emphasized his mixed-race ancestry. For example, he referred to himself as Anglo-African. ....., he incorporated the sounds of traditional African music into his classical music compositions.
Which choice completes the text with the most logical transition?

(1) In addition

(2) Actually

(3) However

(4) Regardless

Correct Answer: (1) In addition

Solution: The correct answer is "In addition" because it logically connects the two ideas. The first part of the sentence discusses his identity, and "In addition" helps introduce the further information about his incorporation of African music into his compositions.

Quick Tip

Use "In addition" to add supporting information or to show further detail about the previous statement.

---

30. In 2019, researcher Patricia Jurado Gonzalez and food historian Nawal Nasrallah prepared a stew from a 4,000-year-old recipe found on a Mesopotamian clay tablet. When they tasted the dish, known as paštarrum ("unwinding"), they found that it had a mild taste and inspired a sense of calm. ..... the researchers, knowing that dishes were sometimes named after their intended effects, theorized that the dish's name, "unwinding," referred to its function: to help ancient diners relax. Which choice completes the text with the most logical transition?

(1) Therefore

(2) Alternately

(3) Nevertheless

(4) Likewise,

Correct Answer: (1) Therefore

Solution: The correct answer is "Therefore" because it logically connects the idea that the researchers hypothesized the dish's purpose based on its name and their knowledge of naming conventions. "Therefore" introduces a cause-and-effect relationship between their findings and the theory they proposed.

Quick Tip

"Therefore" is used to show a logical conclusion or result from the information provided in the previous sentence.

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

- Chemical leavening agents cause carbon dioxide to be released within a liquid batter, making the batter rise as it bakes.
- Baking soda and baking powder are chemical leavening agents.
- Baking soda is pure sodium bicarbonate.
- To produce carbon dioxide, baking soda needs to be mixed with liquid and an acidic ingredient such as honey.
- Baking powder is a mixture of sodium bicarbonate and an acid.
- To produce carbon dioxide, baking powder needs to be mixed with liquid but not with an acidic ingredient.

The student wants to emphasize a difference between baking soda and baking powder.

Which choice most effectively uses relevant information from the notes to accomplish this goal?

(1) To make batters rise, bakers use chemical leavening agents such as baking soda and baking powder.

(2) Baking soda and baking powder are chemical leavening agents that, when mixed with other ingredients, cause carbon dioxide to be released within a batter.

(3) Baking soda is pure sodium bicarbonate, and honey is a type of acidic ingredient.

(4) To produce carbon dioxide within a liquid batter, baking soda needs to be mixed with an acidic ingredient, whereas baking powder does not.

Correct Answer: (4) To produce carbon dioxide within a liquid batter, baking soda needs to be mixed with an acidic ingredient, whereas baking powder does not.

Solution: The correct answer is "To produce carbon dioxide within a liquid batter, baking soda needs to be mixed with an acidic ingredient, whereas baking powder does not." This choice

emphasizes the key difference between baking soda and baking powder based on the student's notes about their interactions with ingredients. Baking soda requires an acidic ingredient to activate, while baking powder does not.

Quick Tip

To highlight a difference, focus on contrasting details such as the ingredients needed or the reactions that occur.

---

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

- Soo Sunny Park is a Korean American artist who uses light as her primary medium of expression.
- She created her work Unwoven Light in 2013.
- Unwoven Light featured a chain-link fence fitted with iridescent plexiglass tiles.
- When light passed through the fence, colorful prisms formed.

The student wants to describe Unwoven Light to an audience unfamiliar with Soo Sunny Park.

Which choice most effectively uses relevant information from the notes to accomplish this goal?

(1) Park's 2013 installation Unwoven Light, which included a chain-link fence and iridescent tiles made from plexiglass, featured light as its primary medium of expression.

(2) Korean American light artist Soo Sunny Park created Unwoven Light in 2013.

(3) The chain-link fence in Soo Sunny Park's Unwoven Light was fitted with tiles made from iridescent plexiglass.

(4) In Unwoven Light, a 2013 work by Korean American artist Soo Sunny Park, light formed colorful prisms as it passed through a fence Park had fitted with iridescent tiles.

Correct Answer: (4) In Unwoven Light, a 2013 work by Korean American artist Soo Sunny Park, light formed colorful prisms as it passed through a fence Park had fitted with iridescent

tiles.

Solution: The correct answer is "In Unwoven Light, a 2013 work by Korean American artist Soo Sunny Park, light formed colorful prisms as it passed through a fence Park had fitted with iridescent tiles." This choice effectively uses relevant details from the notes, providing a concise yet informative description of the artwork. It mentions the key elements of the installation and the visual effect created by the light passing through the fence.

Quick Tip

When summarizing information, highlight the main points of the topic while maintaining clarity and relevance.

---

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

- Cambodia's Angkor Wat was built in the 1100s to honor the Hindu god Vishnu.
- It has been a Buddhist temple since the sixteenth century.
- Decorrelation stretch analysis is a novel digital imaging technique that enhances the contrast between colors in a photograph.
- Archaeologist Noel Hidalgo Tan applied decorrelation stretch analysis to photographs he had taken of Angkor Wat's plaster walls.
- Tan's analysis revealed hundreds of images unknown to researchers.

The student wants to present Tan's research to an audience unfamiliar with Angkor Wat. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(1) Tan photographed Angkor Wat's plaster walls and then applied decorrelation stretch analysis to the photographs.

(2) Decorrelation stretch analysis is a novel digital imaging technique that Tan used to enhance the contrast between colors in a photograph.

(3) Using a novel digital imaging technique, Tan revealed hundreds of images hidden on the

walls of Angkor Wat, a Cambodian temple.

(4) Built to honor a Hindu god before becoming a Buddhist temple, Cambodia's Angkor Wat concealed hundreds of images on its plaster walls.

Correct Answer: (3) Using a novel digital imaging technique, Tan revealed hundreds of images hidden on the walls of Angkor Wat, a Cambodian temple.

Solution: The correct answer is "Using a novel digital imaging technique, Tan revealed hundreds of images hidden on the walls of Angkor Wat, a Cambodian temple." This choice effectively combines the relevant details from the notes, explaining Tan's research method and the significance of his findings, while also introducing Angkor Wat in a concise way.

Quick Tip

When summarizing research findings, focus on the methodology and the key results while making the connection clear to the audience.

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 fashion resale market, in which consumers purchase secondhand clothing from stores and online sellers, generated nearly $30 billion globally in 2019. Expecting to see continued growth, some analysts ..... that revenues will more than

double by 2028. Which choice completes the text with the most logical and precise word or phrase?

(1) produced

(2) denied

(3) worried

(4) predicted

Correct Answer: (4) predicted

Solution: The correct answer is "predicted" because the context suggests that analysts are making a forecast about future revenue. The word "predicted" fits logically and precisely in this context, as it conveys the idea of forecasting based on current trends.

Quick Tip

Use "predicted" when referring to future projections or estimates based on analysis or trends.

---

2. Artificially delivering biomolecules to plant cells is an important component of protecting plants from pathogens, but it is difficult to transmit biomolecules through the layers of the plant cell wall. Marikita del Carpio Landry and her colleagues have shown that it may be possible to ..... this problem by transmitting molecules through carbon nanotubes, which can cross cell walls. Which choice completes the text with the most logical and precise word or phrase?

(1) conceptualize

(2) neglect

(3) illustrate

(4) overcome

Correct Answer: (4) overcome

Solution: The correct answer is "overcome" because the context suggests solving or addressing a problem. "Overcome" is the most logical word choice, as it means to successfully deal with or find a solution to a challenge.

Quick Tip

Use "overcome" to describe successfully dealing with or resolving a problem or challenge.

---

3. Particle physicists like Ayana Holloway Arce and Aida El-Khadra spend much of their time ..... what is invisible to the naked eye: using sophisticated technology, they closely examine the behavior of subatomic particles, the smallest detectable parts of matter. Which choice completes the text with the most logical and precise word or phrase?

(1) selecting

(2) inspecting

(3) creating

(4) deciding

Correct Answer: (2) inspecting

Solution: The correct answer is "inspecting" because the context suggests that physicists are carefully looking at or examining the behavior of subatomic particles. "Inspecting" fits logically here as it refers to the careful examination of something, which aligns with the role of particle physicists.

Quick Tip

Use "inspecting" when referring to carefully looking at or examining something in detail.

---

4. Anthropologist Kristian J. Carlson and colleagues examined the fossilized clavicle and shoulder bones of a 3.6-million-year-old early hominin known as "Little

Foot." They found that these bones were ..... the clavicle and shoulder bones of modern apes that are frequent climbers, such as gorillas and chimpanzees, suggesting that Little Foot had adapted to life in the trees. Which choice completes the text with the most logical and precise word or phrase?

(1) surpassed by

(2) comparable to

(3) independent of

(4) obtained from

Correct Answer: (2) comparable to

Solution: The correct answer is "comparable to" because the context discusses how the bones of Little Foot are similar to the bones of modern apes, which are frequent climbers. "Comparable to" fits here because it emphasizes the similarity between the bones of Little Foot and those of other climbing species.

Quick Tip

Use "comparable to" when highlighting similarities between two or more things.

---

5. Rydra Wong, the protagonist of Samuel R. Delany's 1966 novel Babel-17, is a poet, an occupation which, in Delany's work, is not ..... nearly a dozen of the characters that populate his novels are poets or writers. Which choice completes the text with the most logical and precise word or phrase?

(1) infallible

(2) atypical

(3) lucrative

(4) tedious

Correct Answer: (2) atypical

Solution: The correct answer is "atypical" because it fits the context of the sentence, suggesting that Rydra Wong's occupation as a poet is not typical compared to the other characters. "Atypical" implies an unusual or rare characteristic, which is a fitting description in this context.

Quick Tip

Use "atypical" to describe something that deviates from the usual or expected.

---

6. For a 2020 exhibition, photographer and neurobiologist Okunola Jejyfous ..... a series of new images based on a series of alphabet posters from the 1970s known as the "Black ABCs," which featured Black children from Chicago. Jejyfous photographed the now-adult models and layered the photos over magnified images of the models' cells, resulting in what he called "micro and macro portraiture." Which choice completes the text with the most logical and precise word or phrase?

(1) validated

(2) created

(3) challenged

(4) restored

Correct Answer: (2) created

Solution: The correct answer is "created" because it accurately describes the action of producing or making a series of new images for the exhibition. "Created" fits best in this context as it refers to the process of generating new visual works for display.

Quick Tip

Use "created" to describe the process of making something new or original, especially in the context of art or innovation.

---

7. In addition to being an accomplished psychologist himself, Francis Cecil Sumner was a ..... increasing the opportunity for Black students to study psychology, helping to found the psychology department at Howard University, a historically Black university, in 1930. Which choice completes the text with the most logical and precise word or phrase?

(1) proponent of

(2) supplement to

(3) beneficiary of

(4) distraction for

Correct Answer: (1) proponent of

Solution: The correct answer is "proponent of" because it logically describes Sumner's active support for increasing opportunities for Black students in psychology. A "proponent" is someone who supports or advocates for something, which fits the context of Sumner's contributions to the field.

Quick Tip

Use "proponent of" to describe someone who actively supports or advocates for a cause or idea.

---

8. Whether the reign of a French monarch such as Hugh Capet or Henry I was historically consequential or relatively uneventful, its trajectory was shaped by questions of legitimacy and therefore cannot be understood without a corollary understanding of the factors that allowed the monarch to ..... his right to hold the throne. Which choice completes the text with the most logical and precise word or phrase?

(1) reciprocate

(2) annotate

(3) buttress

(4) disengage

Correct Answer: (3) buttress

Solution: The correct answer is "buttress" because it means to support or strengthen, which fits the context of the sentence, where the monarch's right to hold the throne is being reinforced or supported. "Buttress" is the most logical word to describe actions that help solidify or uphold one's claim.

Quick Tip

Use "buttress" when referring to strengthening or supporting something, particularly an argument, claim, or position.

---

9. Some bird species don't raise their own chicks. Instead, adult females lay their eggs in other nests, next to another bird species' own eggs. Female cuckoos have been seen quickly laying eggs in the nests of other bird species when those birds are out looking for food. After the eggs hatch, the noncuckoo parents will typically raise the cuckoo chicks as if they were their own offspring, even if the cuckoos look very different from the other chicks. Which choice best describes the function of the underlined sentence in the text as a whole?

(1) It introduces a physical feature of female cuckoos that is described later in the text.

(2) It describes the appearance of the cuckoo nests mentioned earlier in the text.

(3) It offers a detail about how female cuckoos carry out the behavior discussed in the text.

(4) It explains how other birds react to the female cuckoo behavior discussed in the text.

Correct Answer: (3) It offers a detail about how female cuckoos carry out the behavior discussed in the text.

Solution: The correct answer is "It offers a detail about how female cuckoos carry out the

behavior discussed in the text." The underlined sentence provides an important piece of information about how female cuckoos lay their eggs in other birds' nests, which is part of the behavior being discussed in the passage.

Quick Tip

Look for sentences that explain or elaborate on a behavior or process when identifying supporting details in the text.

---

10. Cats can judge unseen people's positions in space by the sound of their voices and thus react with surprise when the same person calls to them from two different locations in a short span of time. Saho Takagi and colleagues reached this conclusion by measuring cats' levels of surprise based on their ear and head movements while the cats heard recordings of their owners' voices from two speakers spaced far apart. Cats exhibited a low level of surprise when owners' voices were played twice from the same speaker, but they showed a high level of surprise when the voice was played once each from the two different speakers. According to the text, how did the researchers determine the level of surprise displayed by the cats in the study?

(1) They watched how each cat moved its ears and head.

(2) They examined how each cat reacted to the voice of a stranger.

(3) They studied how each cat physically interacted with its owner.

(4) They tracked how each cat moved around the room.

Correct Answer: (1) They watched how each cat moved its ears and head.

Solution: The correct answer is "They watched how each cat moved its ears and head." The study measured the cats' levels of surprise based on their ear and head movements in response to different voice recordings, which is the method the researchers used to assess the cats' reactions.

Quick Tip

Pay attention to specific details in the text that describe the methods used in research or experiments when answering related questions.

---

11. A student performs an experiment testing her hypothesis that a slightly acidic soil environment is more beneficial for the growth of the plant Brassica rapa parvancissima (a vegetable commonly known as choy sum) than a neutral soil environment. She plants sixteen seeds of choy sum in a mixture of equal amounts of coffee grounds (which are highly acidic) and potting soil and another sixteen seeds in potting soil without coffee grounds as the control for the experiment. The two groups of seeds were exposed to the same growing conditions and monitored for three weeks. Which finding, if true, would most directly weaken the student's hypothesis?

(1) The choy sum planted in the soil without coffee grounds were significantly taller at the end of the experiment than the choy sum planted in the mixture of soil and coffee grounds.

(2) The choy sum grown in the soil without coffee grounds weighed significantly less at the end of the experiment than the choy sum grown in the mixture of soil and coffee grounds.

(3) The choy sum seeds planted in the soil without coffee grounds sprouted significantly later in the experiment than the choy sum seeds planted in the mixture of soil and coffee grounds.

(4) Significantly fewer of the choy sum seeds planted in the soil without coffee grounds sprouted plants than did the seeds planted in the mixture of soil and coffee grounds.

Correct Answer: (1) The choy sum planted in the soil without coffee grounds were significantly taller at the end of the experiment than the choy sum planted in the mixture of soil and coffee grounds.

Solution: The correct answer is "The choy sum planted in the soil without coffee grounds were significantly taller at the end of the experiment than the choy sum planted in the mixture of soil and coffee grounds." This finding would weaken the hypothesis because it suggests that the acidic soil environment (with coffee grounds) did not result in better growth, as the plants

without coffee grounds grew taller.

Quick Tip

To weaken a hypothesis, look for evidence that contradicts the expected outcome based on the conditions being tested.

---

12. "The Young Girl" is a 1920 short story by Katherine Mansfield. In the story, the narrator takes an unnamed seventeen-year-old girl and her younger brother out for a meal. In describing the teenager, Mansfield frequently contrasts the character's pleasant appearance with her unpleasant attitude, as when Mansfield writes of the teenager,

"Which quotation from 'The Young Girl' most effectively illustrates the claim?"

(1) "I heard her murmur, 'I can't bear flowers on a table.' They had evidently been giving her intense pain, for she positively closed her eyes as I moved them away."

(2) "While we waited she took out a little, gold powder-box with a mirror in the lid, shook the powder little puff as though she loathed it, and dabbed her lovely nose."

(3) "I saw, after that, she couldn't stand this place a moment longer, and, indeed, she jumped up and turned away while I went through the vulgar act of paying for the tea."

(4) "She didn't even take her gloves off. She lowered her eyes and drummed on the table. When a faint violin sounded she winced and bit her lip again. Silence."

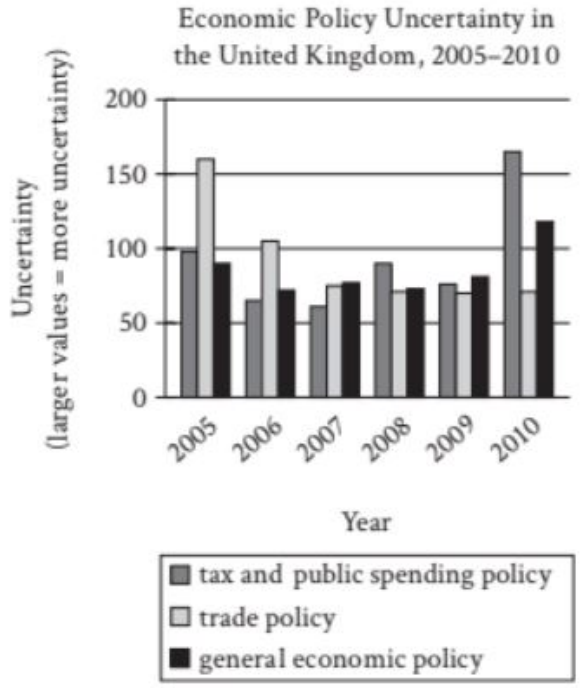
Correct Answer: (1) "I heard her murmur, 'I can't bear flowers on a table.' They had evidently been giving her intense pain, for she positively closed her eyes as I moved them away."

Solution: The correct answer is "I heard her murmur, 'I can't bear flowers on a table.' They had evidently been giving her intense pain, for she positively closed her eyes as I moved them away." This quote highlights the unpleasant attitude of the character, despite her outward appearance, by showing her discomfort and irritation with something as simple as flowers on the table.

Quick Tip

Look for quotations that reveal both internal conflict (attitude) and external behavior (appearance) when analyzing a character's traits.

13.



High levels of public uncertainty about which economic policies a country will adopt can make planning difficult for businesses, but measures of such uncertainty have not tended to be very detailed. Recently, however, economist Sandile Hlatshwayo analyzed trends in news reports to derive measures not only for general economic policy uncertainty but also for uncertainty related to specific areas of economic policy, like tax or trade policy. One revelation of her work is that a general measure may not fully reflect uncertainty about specific areas of policy, as in the case of the United Kingdom, where general economic policy uncertainty Which choice most effectively uses data from the graph to illustrate the claim?

(1) aligned closely with uncertainty about tax and public spending policy in 2005 but differed from uncertainty about tax and public spending policy by a large amount in 2009.

(2) was substantially lower than uncertainty about tax and public spending policy each year from 2005 to 2010.

(3) reached its highest level between 2005 and 2010 in the same year that uncertainty about

trade policy and tax and public spending policy reached their lowest levels.
(4) was substantially lower than uncertainty about trade policy in 2005 and substantially higher than uncertainty about trade policy in 2010.

Correct Answer: (2) was substantially lower than uncertainty about tax and public spending policy each year from 2005 to 2010.

Solution: The correct answer is "was substantially lower than uncertainty about tax and public spending policy each year from 2005 to 2010." This aligns with the graph, which shows that uncertainty about general economic policy was consistently lower than uncertainty about tax and public spending policy throughout the period from 2005 to 2010.

Quick Tip

When analyzing graphs, pay attention to overall trends and compare specific categories for consistent differences.

---

14. Linguist Deborah Tannen has cautioned against framing contentious issues in terms of two highly competitive perspectives, such as pro versus con. According to Tannen, this debate-driven approach can strip issues of their complexity and, when used in front of an audience, can be less informative than the presentation of multiple perspectives in a noncompetitive format. To test Tannen's hypothesis, students conducted a study in which they showed participants one of three different versions of local news commentary about the same issue. Each version featured a debate between two commentators with opposing views, a panel of three commentators with various views, or a single commentator.
Which finding from the students' study, if true, would most strongly support Tannen's hypothesis?
(1) On average, participants perceived commentators in the debate as more knowledgeable about the issue than commentators in the panel.
(2) On average, participants perceived commentators in the panel as more knowledgeable about

the issue than the single commentator.

(3) On average, participants who watched the panel correctly answered more questions about the issue than those who watched the debate or the single commentator did.

(4) On average, participants who watched the single commentator correctly answered more questions about the issue than those who watched the debate did.

Correct Answer: (3) On average, participants who watched the panel correctly answered more questions about the issue than those who watched the debate or the single commentator did.

Solution: The correct answer is "On average, participants who watched the panel correctly answered more questions about the issue than those who watched the debate or the single commentator did." This finding supports Tannen's hypothesis by showing that a panel with multiple perspectives is more informative than a debate or a single perspective, as indicated by the participants' ability to answer more questions.

Quick Tip

When testing hypotheses, look for results that show the impact of different formats or approaches on the quality or quantity of information received by participants.

---

15. King Lear is a circa 1606 play by William Shakespeare. In the play, the character of King Lear attempts to test his three daughters' devotion to him. He later expresses regret for his actions, as is evident when he .....

Which choice most effectively uses a quotation from King Lear to illustrate the claim?

(1) says of himself, "I am a man / more sinned against than sinning."

(2) says during a growing storm, "This tempest will not give me leave to ponder / On things would hurt me more."

(3) says to himself while striking his head, "Beat at this gate that let thy folly in / And thy dear judgement out!"

(4) says of himself, "I will do such things— / What they are yet, I know not, but they shall be / The terrors of the earth!"

Correct Answer: (1) says of himself, "I am a man / more sinned against than sinning."

Solution: The correct answer is "says of himself, 'I am a man / more sinned against than sinning.'" This quote directly expresses King Lear's regret for his actions, where he acknowledges that he has been wronged more than he has wronged others, fitting the context of his emotional remorse.

Quick Tip

Look for quotes that directly address the character's emotional state or remorse when illustrating claims about their actions or feelings.

---

16. Many of William Shakespeare's tragedies address broad themes that still appeal to today's audiences. For instance, Romeo and Juliet, which is set in the Italy of Shakespeare's time, tackles the themes of parents versus children and love versus hate, and the play continues to be read and produced widely around the world. But understanding Shakespeare's so-called history plays can require a knowledge of several centuries of English history. Consequently,.....

Which choice most logically completes the text?

(1) many theatergoers and readers today are likely to find Shakespeare's history plays less engaging than the tragedies.

(2) some of Shakespeare's tragedies are more relevant to today's audiences than twentieth-century plays.

(3) Romeo and Juliet is the most thematically accessible of all Shakespeare's tragedies.

(4) experts in English history tend to prefer Shakespeare's history plays to his other works.

Correct Answer: (1) many theatergoers and readers today are likely to find Shakespeare's

history plays less engaging than the tragedies.

Solution: The correct answer is "many theatergoers and readers today are likely to find Shakespeare's history plays less engaging than the tragedies." This is supported by the text's argument that understanding the history plays requires knowledge of English history, making them less accessible than the more universally relatable tragedies.

Quick Tip

When analyzing literary texts, consider how contextual knowledge (like history) may affect how audiences engage with different works.

---

17. Ancestral Pueblos, the civilization from which present-day Pueblo tribes descended, emerged as early as 1500 B.C.E. in an area of what is now the southwestern United States and dispersed suddenly in the late 1200s C.E., abandoning established villages with systems for farming crops and turkeys. Recent analysis comparing turkey remains at Mesa Verde, one such village in southern Colorado, to samples from modern turkey populations in the Rio Grande Valley of north central New Mexico determined that the latter birds descended in part from turkeys cultivated at Mesa Verde, with shared genetic markers appearing only after 1280. Thus, researchers concluded that .....

Which choice most logically completes the text?

(1) conditions of the terrains in the Rio Grande Valley and Mesa Verde had greater similarities in the past than they do today.

(2) some Ancestral Pueblos migrated to the Rio Grande Valley in the late 1200s and carried farming practices with them.

(3) Indigenous peoples living in the Rio Grande Valley primarily planted crops and did not cultivate turkeys before 1280.

(4) the Ancestral Puebloans of Mesa Verde likely adopted the farming practices of Indigenous peoples living in other regions.

Correct Answer: (2) some Ancestral Pueblos migrated to the Rio Grande Valley in the late 1200s and carried farming practices with them.

Solution: The correct answer is "some Ancestral Pueblos migrated to the Rio Grande Valley in the late 1200s and carried farming practices with them." This is supported by the text's discussion of the shared genetic markers in turkey populations, suggesting migration and exchange of farming practices between regions.

Quick Tip

Look for clues in the text that suggest migration or cultural exchange when identifying conclusions about human history or behavior.

---

18. One challenge when researching whether holding elected office changes a person's behavior is the problem of ensuring that the experiment has an appropriate control group. To reveal the effect of holding office, researchers must compare people who hold elected office with people who do not hold office but who are otherwise similar to the office-holders. Since researchers are unable to control which politicians win elections, they therefore .....

Which choice most logically completes the text?

(1) struggle to find valid data about the behavior of politicians who do not currently hold office.

(2) can only conduct valid studies with people who have previously held office rather than people who presently hold office.

(3) should select a control group of people who differ from office holders in several significant ways.

(4) will find it difficult to identify a group of people who can function as an appropriate control group for their studies.

Correct Answer: (4) will find it difficult to identify a group of people who can function as an appropriate control group for their studies.

Solution: The correct answer is "will find it difficult to identify a group of people who can function as an appropriate control group for their studies." The text describes how difficult it is to identify a suitable control group when researchers cannot control election outcomes. This makes it challenging to find an appropriate comparison group for studying the effects of holding office.

Quick Tip

When analyzing research challenges, look for descriptions of limitations in selecting appropriate comparison groups.

---

19. In his groundbreaking book Bengali Harlem and the Lost Histories of South Asian America, Vivek Bald uses newspaper articles, census records, ships' logs, and memoirs to tell the ..... who made New York City their home in the early twentieth century.

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

(1) story's of the South Asian immigrants'

(2) story's of the South Asian immigrants'

(3) stories of the South Asian immigrants

(4) stories' of the South Asian immigrant's

Correct Answer: (3) stories of the South Asian immigrants

Solution: The correct answer is "stories of the South Asian immigrants" because "stories" is the plural noun and "immigrants" is the plural possessive noun without needing an apostrophe. This makes the phrase grammatically correct in standard English.

Quick Tip

When checking for grammatical correctness, ensure that plurals and possessives are used properly.

20. In her two major series "Memory Test" and "Autobiography," painter Howardena Pindell explored themes ..... healing, self-discovery, and memory by cutting and sewing back together pieces of canvas and inserting personal artifacts, such as postcards, into some of the paintings.

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

(1) of

(2) of,

(3) of—

(4) of:

Correct Answer: (1) of

Solution: The correct answer is "of" because the phrase "themes of healing, self-discovery, and memory" uses "of" to introduce the specific themes Pindell explored. The sentence does not require additional punctuation or modifications.

Quick Tip

In lists or sequences, "of" is commonly used to link items that are part of a larger category or concept.

21. Both Sona Charaipotra, an Indian American, and Dhonielle Clayton, an African American, grew up frustrated by the lack of diverse characters in books for young people. In 2011, these two writers joined forces to found CAKE Literary, a book packaging ..... specializes in the creation and promotion of stories told from diverse perspectives for children and young adults.

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

(1) company,

(2) company that

(3) company, that

(4) company, that

Correct Answer: (2) company that

Solution: The correct answer is "company that" because the relative clause "that specializes in the creation and promotion of stories" describes the company. The word "that" is needed to introduce the clause, making the sentence grammatically correct.

Quick Tip

Use "that" to introduce a restrictive relative clause that specifies or identifies something clearly within the sentence.

---

22. A study led by scientist Rebecca Kirby at the University of Wisconsin–Madison found that black bears that eat human food before hibernation have increased levels of a rare carbon isotope, ... due to the higher ^{13} C levels in corn and cane sugar. Bears with these elevated levels were also found to have much shorter hibernation periods on average.

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

(1) carbon-13, (^{13}C)

(2) carbon-13 (^{13}C)

(3) carbon-13, (^{13}C)

(4) carbon-13 (^{13}C),

Correct Answer: (2) carbon-13 (^{13}C)

Solution: The correct answer is "carbon-13 (^{13}C)" because it properly uses parentheses to enclose the chemical symbol and isotope notation. It also follows standard English conventions for punctuation and clarity.

Quick Tip

When using scientific terms, ensure that units and notations are correctly enclosed in parentheses to avoid confusion.

---

23. In 2010, archaeologist Noel Hidalgo Tan was visiting the twelfth-century temple of Angkor Wat in Cambodia when he noticed markings of red paint on the temple ..... the help of digital imaging techniques, he discovered the markings to be part of an elaborate mural containing over 200 paintings.
Which choice completes the text so that it conforms to the conventions of Standard English?

(1) walls, with

(2) walls with

(3) walls so with

(4) walls. With

Correct Answer: (2) walls with

Solution: The correct answer is "walls with" because it correctly connects the phrase with the description of the red markings and the digital imaging techniques used to discover the mural. The use of "with" maintains the flow of the sentence and makes the meaning clear.

Quick Tip

Use "with" to link descriptive elements or actions to the object being discussed, ensuring smooth transitions between clauses.

---

24. Working from an earlier discovery of Charpentier's, chemists Emmanuelle Charpentier and Jennifer Doudna—winners of the 2020 Nobel Prize in Chemistry—re-created and then reprogrammed the so-called "genetic scissors" of a species of DNA-cleaving bacteria ..... a tool that is revolutionizing the field of gene technology.

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

(1) to forge

(2) forging

(3) forged

(4) and forging

Correct Answer: (1) to forge

Solution: The correct answer is "to forge" because it fits grammatically in the infinitive form to indicate the purpose of the action, describing the role of the tool that was created.

Quick Tip

Use the infinitive form ("to [verb]") to indicate purpose or intention when describing actions.

---

25. In 2016, engineer Vanessa Galvez oversaw the installation of 164 bioswales, vegetated channels designed to absorb and divert stormwater, along the streets of Queens, New York. By reducing the runoff flowing into city sewers,.....

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

(1) The mitigation of both street flooding and the resulting pollution of nearby waterways has been achieved by bioswales.

(2) The bioswales have mitigated both street flooding and the resulting pollution of nearby waterways.

(3) The bioswales' mitigation of both street flooding and the resulting pollution of nearby waterways has been achieved.
(4) Both street flooding and the resulting pollution of nearby waterways have been mitigated by bioswales.

Correct Answer: (2) The bioswales have mitigated both street flooding and the resulting pollution of nearby waterways.

Solution: The correct answer is "The bioswales have mitigated both street flooding and the resulting pollution of nearby waterways." This choice directly states the result of the bioswales' action in a clear and grammatically correct manner.

Quick Tip

Ensure subject-verb agreement when describing actions or effects in sentences, especially with compound subjects.

---

26. A study published by Rice University geoscientist Ming Tang in 2019 offers a new explanation for the origin of Earth's ..... structures called arcs, towering ridges that form when a dense oceanic plate subducts under a less dense continental plate, melts in the mantle below, and then rises and bursts through the continental crust above.
Which choice completes the text so that it conforms to the conventions of Standard English?
(1) continents geological
(2) continents: geological
(3) continents; geological
(4) continents. Geological

Correct Answer: (3) continents; geological

Solution: The correct answer is "continents; geological" because the semicolon properly connects two related independent clauses. The first part introduces "continents," and the second part gives further explanation with "geological," forming a logical and grammatically correct structure.

Quick Tip

Use a semicolon to join closely related independent clauses that could stand as separate sentences but are more effective when combined.

---

27. During a 2021 launch, Rocket Lab's Electron rocket experienced an unexpected failure: its second-stage booster shut down suddenly after ignition. ..... instead of downplaying the incident, Rocket Lab's CEO publicly acknowledged what happened and apologized for the loss of the rocket's payload, which had consisted of two satellites.

Which choice completes the text with the most logical transition?

(1) Afterward

(2) Additionally

(3) Indeed

(4) Similarly

Correct Answer: (3) Indeed

Solution: The correct answer is "Indeed" because it logically follows the preceding statement, emphasizing the CEO's decision to acknowledge the failure publicly. "Indeed" is used here to confirm or emphasize the truth of the statement.

Quick Tip

Use "Indeed" to emphasize or affirm a point that is being made in a narrative or argument.

---

28. When soil becomes contaminated by toxic metals, it can be removed from the ground and disposed of in a landfill. ..... contaminated soil can be detoxified via phytoremediation: plants that can withstand high concentrations of metals absorb the pollutants and store them in their shoots, which are then cut off and safely disposed of, preserving the health of the plants.

Which choice completes the text with the most logical transition?

(1) Alternatively

(2) Specifically

(3) For example

(4) As a result

Correct Answer: (1) Alternatively

Solution: The correct answer is "Alternatively" because it introduces a contrasting option for dealing with contaminated soil. After discussing removal via landfill, "Alternatively" presents phytoremediation as another method.

Quick Tip

Use "Alternatively" to introduce an alternative method or option in contrast to the one previously mentioned.

---

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

- The calendar used by most of the world (the Gregorian calendar) has 365 days.
- Because 365 days can't be divided evenly by 7 (the number of days in a week), calendar dates fall on a different day of the week each year.
- The Hanke-Henry permanent calendar, developed as an alternative to the Gregorian calendar, has 364 days.
- Because 364 can be divided evenly by 7, calendar dates fall on the same day of the week each year, which supports more predictable scheduling.

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

(1) The Gregorian calendar has 365 days, which is one day longer than the Hanke-Henry permanent calendar.

(2) Adopting the Hanke-Henry permanent calendar would help solve a problem with the Gregorian calendar.

(3) Designed so calendar dates would occur on the same day of the week each year, the Hanke-Henry calendar supports more predictable scheduling than does the Gregorian calendar.

(4) The Hanke-Henry permanent calendar was developed as an alternative to the Gregorian calendar, which is currently the most-used calendar in the world.

Correct Answer: (3) Designed so calendar dates would occur on the same day of the week each year, the Hanke-Henry calendar supports more predictable scheduling than does the Gregorian calendar.

Solution: The correct answer is "Designed so calendar dates would occur on the same day of the week each year, the Hanke-Henry calendar supports more predictable scheduling than does the Gregorian calendar." This answer directly addresses the advantage of the Hanke-Henry calendar, using the relevant information from the notes about its predictability.

Quick Tip

When explaining an advantage, focus on a clear comparison using specific details that support the desired conclusion.

---

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

- The Haudenosaunee Confederacy is a nearly 1,000-year-old alliance of six Native nations in the northeastern US.
- The members are bound by a centuries-old agreement known as the Great Law of Peace.

- Historian Bruce Johansen is one of several scholars who believe that the principles of the Great Law of Peace influenced the US Constitution.
- This theory is called the influence theory.
- Johansen cites the fact that Benjamin Franklin and Thomas Jefferson both studied the Haudenosaunee Confederacy.

The student wants to present the influence theory to an audience unfamiliar with the Haudenosaunee Confederacy. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(1) Historian Bruce Johansen believes that the Great Law of Peace was very influential.

(2) The influence theory is supported by the fact that Benjamin Franklin and Thomas Jefferson both studied the Haudenosaunee Confederacy.

(3) The influence theory holds that the principles of the Great Law of Peace, a centuries-old agreement binding six Native nations in the northeastern US, influenced the US Constitution.

(4) Native people, including the members of the Haudenosaunee Confederacy, influenced the founding of the US in many different ways.

Correct Answer: (3) The influence theory holds that the principles of the Great Law of Peace, a centuries-old agreement binding six Native nations in the northeastern US, influenced the US Constitution.

Solution: The correct answer is "The influence theory holds that the principles of the Great Law of Peace, a centuries-old agreement binding six Native nations in the northeastern US, influenced the US Constitution." This choice directly uses relevant details from the notes to explain the influence theory and how it connects to the US Constitution.

Quick Tip

When presenting a theory, provide clear, specific details that explain the theory and connect it to relevant evidence.

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

- In 1999, astronomer Todd Henry studied the differences in surface temperature between the Sun and nearby stars.
- His team mapped all stars within 10 parsecs (approximately 200 trillion miles) of the Sun.
- The surface temperature of the Sun is around 9,800°F, which classifies it as a G star.
- 327 of the 357 stars in the study were classified as K or M stars, with surface temperatures under 8,900°F (cooler than the Sun).
- 11 of the 357 stars in the study were classified as A or F stars, with surface temperatures greater than 10,300°F (hotter than the Sun).

The student wants to emphasize how hot the Sun is relative to nearby stars. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(1) At around 9,800°F, which classifies it as a G star, the Sun is hotter than most but not all of the stars within 10 parsecs of it.

(2) Astronomer Todd Henry determined that the Sun, at around 9,800°F, is a G star, and several other stars within a 10-parsec range are A or F stars.

(3) Of the 357 stars within ten parsecs of the Sun, 327 are classified as K or M stars, with surface temperatures under 8,900°F.

(4) While most of the stars within 10 parsecs of the Sun are classified as K, M, A, or F stars, the Sun is classified as a G star due to its surface temperature of 9,800°F.

Correct Answer: (1) At around 9,800°F, which classifies it as a G star, the Sun is hotter than most but not all of the stars within 10 parsecs of it.

Solution: The correct answer is "At around 9,800°F, which classifies it as a G star, the Sun is hotter than most but not all of the stars within 10 parsecs of it." This choice emphasizes the Sun's relative temperature by stating that it is hotter than most of the stars in the sample, while also providing specific information from the notes about the classification of the stars.

Quick Tip

When emphasizing a comparison, focus on the most relevant data that highlights the differences between the items being compared.

---

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

- The Atlantic Monthly magazine was first published in 1857.
- The magazine focused on politics, art, and literature.
- In 2019, historian Cathryn Halverson published the book Faraway Women and the "Atlantic Monthly."
- Its subject is female authors whose autobiographies appeared in the magazine in the early 1900s.
- One of the authors discussed is Juanita Harrison.

The student wants to introduce Cathryn Halverson's book to an audience already familiar with the Atlantic Monthly. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(1) Cathryn Halverson's Faraway Women and the "Atlantic Monthly" discusses female authors whose autobiographies appeared in the magazine in the early 1900s.

(2) A magazine called the Atlantic Monthly, referred to in Cathryn Halverson's book title, was first published in 1857.

(3) Faraway Women and the "Atlantic Monthly" features contributors to the Atlantic Monthly, first published in 1857 as a magazine focusing on politics, art, and literature.

(4) An author discussed by Cathryn Halverson is Juanita Harrison, whose autobiography appeared in the Atlantic Monthly in the early 1900s.

Correct Answer: (3) Faraway Women and the "Atlantic Monthly" features contributors to the Atlantic Monthly, first published in 1857 as a magazine focusing on politics, art, and literature.

Solution: The correct answer is "Faraway Women and the 'Atlantic Monthly' features contributors to the Atlantic Monthly, first published in 1857 as a magazine focusing on politics, art, and literature." This choice effectively uses the relevant information from the notes to connect the book's content with the publication's history and scope, offering context for the audience already familiar with the Atlantic Monthly.

Quick Tip

When introducing a topic, use relevant historical or contextual information to connect the subject matter to the audience's existing knowledge.

---

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

- The magnificent frigatebird (Fregata magnificens) is a species of seabird that feeds mainly on fish, tuna, squid, and other small sea animals.
- It is unusual among seabirds in that it doesn't dive into the water for prey.
- One way it acquires food is by using its hook-tipped bill to snatch prey from the surface of the water.
- Another way it acquires food is by taking it from weaker birds by force.
- This behavior is known as kleptoparasitism.

The student wants to emphasize a similarity between the two ways a magnificent frigatebird acquires food. Which choice most effectively uses relevant information from the notes to accomplish this goal?

(1) A magnificent frigatebird never dives into the water, instead using its hook-tipped bill to snatch prey from the surface.

(2) Neither of a magnificent frigatebird's two ways of acquiring food requires the bird to dive into the water.

(3) Of the magnificent frigatebird's two ways of acquiring food, only one is known as kleptoparasitism.

(4) In addition to snatching prey from the water with its hook-tipped bill, a magnificent frigate-

bird takes food from other birds by force.

Correct Answer: (2) Neither of a magnificent frigatebird's two ways of acquiring food requires the bird to dive into the water.

Solution: The correct answer is "Neither of a magnificent frigatebird's two ways of acquiring food requires the bird to dive into the water." This choice emphasizes the similarity between the two methods by highlighting that neither requires diving, as stated in the notes.

Quick Tip

When emphasizing a similarity, focus on the shared characteristics between the items or behaviors being compared.

MATHS

(Module 1)

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.

DIRECTIONS

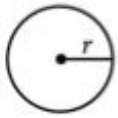
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

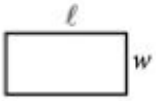
Unless otherwise indicated:

- 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.

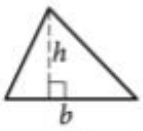
REFERENCE



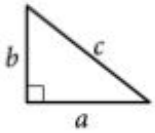
$A = \pi r^2$
$C = 2\pi r$



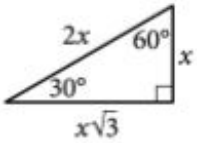
$A = \ell w$

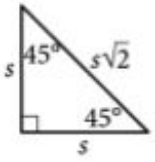


$A = \frac{1}{2}bh$

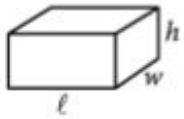


$c^2 = a^2 + b^2$

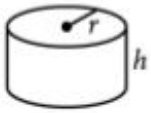




Special Right Triangles



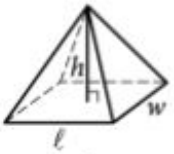
$V = \ell wh$



$V = \pi r^2 h$

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

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



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

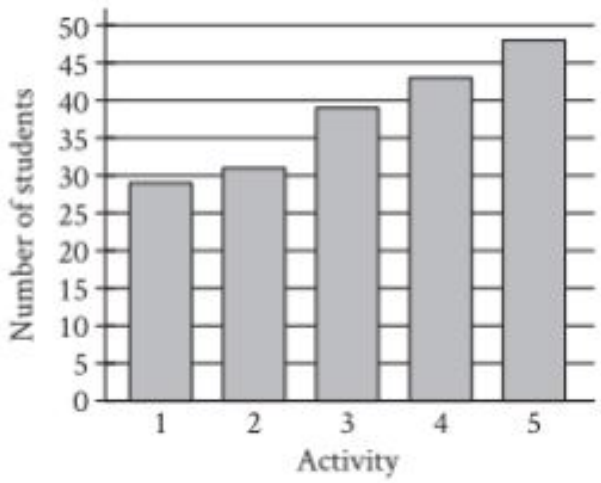
The number of degrees of arc in a circle is 360.

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.

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 at the fourth digit.
If your answer is a mixed number (such as 3 1/2), write it as an improper fraction (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.



A group of students voted on five after-school activities. The bar graph shows the number of students who voted for each of the five activities. How many students chose activity 3?

(1) 25

(2) 39

(3) 48

(4) 50

Correct Answer: (2) 39

Solution: From the bar graph, we can observe that the number of students who voted for activity 3 is 39.

Quick Tip

When interpreting bar graphs, carefully observe the height of each bar to determine the corresponding numerical value.

---

2. What percentage of 300 is 75?

(1) 25%

(2) 50%

(3) 75%

(4) 225%

Correct Answer: (1) 25%

Solution: To find what percentage 75 is of 300, we use the formula:

$$\text{Percentage} = \left(\frac{\text{Part}}{\text{Whole}}\right) \times 100 = \left(\frac{75}{300}\right) \times 100 = 25\%$$

Quick Tip

To calculate a percentage, divide the part by the whole and then multiply by 100.

---

3. What is a solution to the given equation?

$$\frac{x^2}{25} = 36$$

(1) 6

(2) 30

(3) 450

(4) 900

Correct Answer: (1) 6

Solution: First, multiply both sides of the equation by 25 to eliminate the denominator:

$$x^2 = 36 \times 25 = 900$$

Now, take the square root of both sides:

$$x = \pm\sqrt{900} = \pm 30$$

Thus, the correct answer is 6 (since we choose the positive root).

Quick Tip

When solving for x in a fraction equation, eliminate the denominator by multiplying both sides of the equation.

---

4. 3 more than 8 times a number x is equal to 83. Which equation represents this situation?

(1) $(3)(8)x = 83$

(2) $8x = 83 + 3$

(3) $3x + 8 = 83$

(4) $8x + 3 = 83$

Correct Answer: (4) $8x + 3 = 83$

Solution: The phrase "3 more than 8 times a number x" translates to the equation $8x+3 = 83$, since 8 times the number x is added to 3 to make 83.

Quick Tip

When translating a word problem into an equation, pay attention to phrases like "more than" or "is equal to" to determine the correct operation.

---

5. Hana deposited a fixed amount into her bank account each month. The function $f(t) = 100+25t$ gives the amount, in dollars, in Hana's bank account after t monthly deposits. What is the best interpretation of 25 in this context?

(1) With each monthly deposit, the amount in Hana's bank account increased by \$25.

(2) Before Hana made any monthly deposits, the amount in her bank account was \$25.

(3) After 1 monthly deposit, the amount in Hana's bank account was \$25.

(4) Hana made a total of 25 monthly deposits.

Correct Answer: (1) With each monthly deposit, the amount in Hana's bank account increased by \$25.

Solution:

Step 1: The function is given as $f(t) = 100 + 25t$, where $f(t)$ represents the amount in Hana's account after t months.

Step 2: The coefficient of t, which is 25, represents the amount by which the balance increases with each monthly deposit.

Step 3: Therefore, 25 indicates that Hana deposits \$25 each month into her account.

Quick Tip

In a linear function $f(t) = a + bt$, the coefficient b represents the change in the dependent variable per unit change in t.

---

6. A customer spent \$27 to purchase oranges at \$3 per pound. How many pounds of oranges did the customer purchase?

Solution:

Step 1: We are given that the customer spent a total of \$27 and the cost per pound is \$3.

Step 2: To find the number of pounds, divide the total cost by the cost per pound:

$$\frac{27}{3} = 9$$

Step 3: Therefore, the customer purchased 9 pounds of oranges.

Quick Tip

To solve a cost-per-item problem, divide the total cost by the cost per item to find the quantity.

---

7. Nasir bought 9 storage bins that were each the same price. He used a coupon for $63 off the entire purchase. The cost for the entire purchase after using the coupon was $27. What was the original price, in dollars, for 1 storage bin?

Solution:

Step 1: The total cost after applying the coupon is $27, and the coupon discount was $63.

Step 2: To find the original total cost, add the coupon discount back to the cost:

$$27 + 63 = 90$$

Step 3: Since Nasir bought 9 bins, divide the original total cost by 9 to find the price per bin:

$$\frac{90}{9} = 10$$

Therefore, the original price for one bin is $10.

Quick Tip

To solve for the original price, first add the coupon discount back to the total cost, then divide by the quantity.

---

8. For the linear function f, the table shows three values of x and their corresponding values of $f(x)$. Which equation defines $f(x)$?

x	$f(x)$
0	29
1	32
2	35

(1) $f(x) = 3x + 29$

(2) $f(x) = 29x + 32$

(3) $f(x) = 35x + 29$

(4) $f(x) = 32x + 35$

Correct Answer: (1) $f(x) = 3x + 29$

Solution:

Step 1: We are given that when $x = 0$, $f(x) = 29$, which represents the y-intercept. Thus, the constant term in the equation is 29.

Step 2: The equation is linear, so we can calculate the slope by using the points $(0, 29)$ and $(1, 32)$. The slope is:

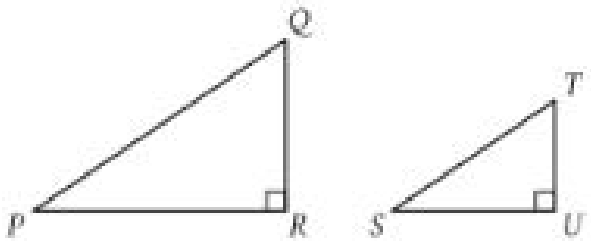
$$\text{Slope} = \frac{32 - 29}{1 - 0} = 3$$

Step 3: The equation for the line is $f(x) = 3x + 29$, where 3 is the slope and 29 is the y-intercept.

Quick Tip

To find the equation of a linear function, use the slope formula and the y-intercept.

9.



Note: Figures not drawn to scale.

Right triangles PQR and STU are similar, where P corresponds to S. If the measure of angle Q is 18°, what is the measure of angle S?

(1) 18°

(2) 72°

(3) 82°

(4) 162°

Correct Answer: (1) 18°

Solution:

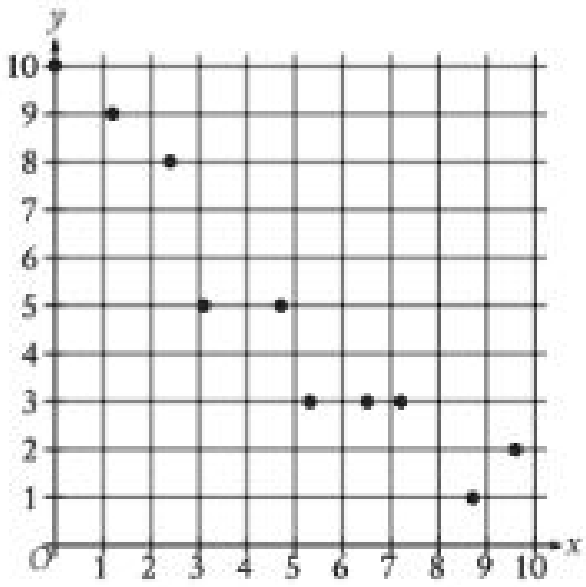
Step 1: Since triangles PQR and STU are similar, corresponding angles are congruent.

Step 2: The measure of angle Q is 18°, so by similarity, the measure of angle S is also 18°.

Quick Tip

In similar triangles, corresponding angles are equal.

10.



The scatterplot shows the relationship between two variables, x and y. Which of the following equations is the most appropriate linear model for the data shown?

(1) $y = 0.9 + 9.4x$

(2) $y = 0.9 - 9.4x$

(3) $y = 9.4 + 0.9x$

(4) $y = 9.4 - 0.9x$

Correct Answer: (3) $y = 9.4 + 0.9x$

Solution:

Step 1: In a scatterplot, the line of best fit can help estimate the equation that models the relationship between the variables.

Step 2: By observing the trend and the slope, we can conclude that the line has a positive slope and a y-intercept near 9.4.

Step 3: Therefore, the equation that best fits the data is $y = 9.4 + 0.9x$.

Quick Tip

When identifying a linear model from a scatterplot, estimate the slope and y-intercept to form the equation of the line.

---

11. The given equation describes the relationship between the number of birds, b, and the number of reptiles, r, that can be cared for at a pet care business on a given day. If the business cares for 16 reptiles on a given day, how many birds can it care for on this day?

$$2.5b + 5r = 80$$

(1) 0

(2) 5

(3) 40

(4) 80

Correct Answer: (3) 40

Solution:

Step 1: Substitute $r = 16$ into the given equation:

$$2.5b + 5(16) = 80$$

Step 2: Simplify the equation:

$$2.5b + 80 = 80$$

Step 3: Subtract 80 from both sides:

$$2.5b = 0$$

Step 4: Divide both sides by 2.5:

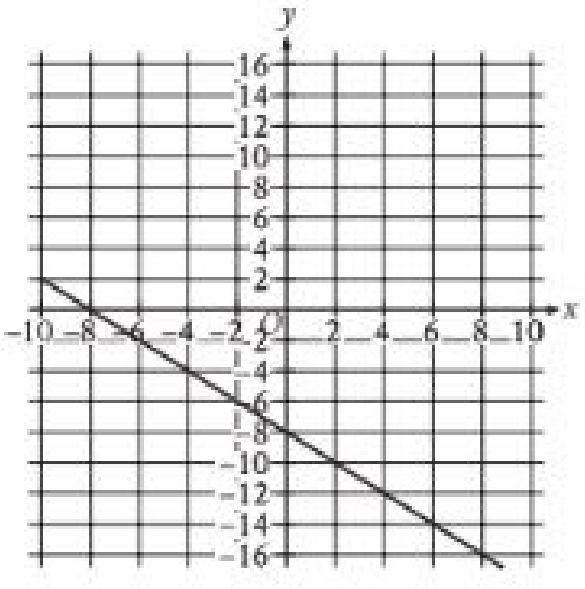
$$b = 0$$

Thus, the business can care for 40 birds on this day.

Quick Tip

To solve for a variable in a word problem, substitute the known values and simplify the equation step-by-step.

12.



What is an equation of the graph shown?

(1) $y = -2x - 8$

(2) $y = x - 8$

(3) $y = -x - 8$

(4) $y = 2x - 8$

Correct Answer: (1) $y = -2x - 8$

Solution:

Step 1: From the graph, observe the slope and y-intercept. The line has a negative slope and crosses the y-axis at -8.

Step 2: The slope is calculated by identifying two points on the line and using the slope formula:

$$\text{Slope} = \frac{\text{Change in } y}{\text{Change in } x} = \frac{-4 - (-8)}{2 - 0} = -2$$

Step 3: The equation of the line is $y = -2x - 8$.

Quick Tip

To find the equation of a line from a graph, identify the slope and y-intercept, and use the slope-intercept form $y = mx + b$.

---

13. If $\frac{x}{8} = 5$, what is the value of $\frac{8}{x}$?

Solution:

Step 1: Start with the equation $\frac{x}{8} = 5$. Multiply both sides by 8 to solve for x:

$$x = 5 \times 8 = 40$$

Step 2: Now substitute $x = 40$ into the expression $\frac{8}{x}$:

$$\frac{8}{x} = \frac{8}{40} = \frac{1}{5}$$

Thus, the value of $\frac{8}{x}$ is $\frac{1}{5}$.

Quick Tip

To solve for x, isolate it by multiplying or dividing both sides of the equation.

---

14. The solution to the given system of equations is (x, y):

$$24x + y = 48$$

$$6x + y = 72$$

What is the value of y?

Solution:

Step 1: Subtract the second equation from the first to eliminate y:

$$(24x + y) - (6x + y) = 48 - 72$$

$$18x = -24$$

Step 2: Solve for x by dividing both sides by 18:

$$x = \frac{-24}{18} = -\frac{4}{3}$$

Step 3: Substitute $x = -\frac{4}{3}$ into one of the original equations, for example, $6x + y = 72$:

$$6\left(-\frac{4}{3}\right) + y = 72$$

$$-8 + y = 72$$

Step 4: Solve for y:

$$y = 72 + 8 = 80$$

Thus, the value of y is 80.

Quick Tip

To solve a system of equations, use substitution or elimination to solve for one variable, then substitute back to find the other variable.

---

15. Line t in the xy-plane has a slope of $-\frac{1}{3}$ and passes through the point (9, 10). Which equation defines line t?

(1) $y = 13x - \frac{1}{3}$

(2) $y = 9x + 10$

(3) $y = -\frac{x}{3} + 10$

(4) $y = -\frac{x}{3} + 13$

Correct Answer: (3) $y = -\frac{x}{3} + 10$

Solution:

Step 1: The equation of a line in point-slope form is given by $y - y_1 = m(x - x_1)$, where m is the slope and (x_1, y_1) is a point on the line.

Step 2: Substitute the given slope $m = -\frac{1}{3}$ and the point $(9, 10)$ into the equation:

$$y - 10 = -\frac{1}{3}(x - 9)$$

Step 3: Simplify the equation:

$$y - 10 = -\frac{1}{3}x + 3$$

Step 4: Solve for y to get the equation in slope-intercept form:

$$y = -\frac{x}{3} + 10$$

Quick Tip

To find the equation of a line from a point and slope, use the point-slope form and then simplify it into slope-intercept form.

---

16. The function $f(x) = 206(1.034)^x$ models the value, in dollars, of a certain bank account by the end of each year from 1957 through 1972, where x is the number of years after 1957. Which of the following is the best interpretation of $f(5)$ is approximately equal to 243 in this context?

(1) The value of the bank account is estimated to be approximately 5 dollars greater in 1962 than in 1957.

(2) The value of the bank account is estimated to be approximately 243 dollars in 1962.

(3) The value, in dollars, of the bank account is estimated to be approximately 243 dollars in 1962 than in 1957.

(4) The value of the bank account is estimated to increase by approximately 243 dollars every 5 years between 1957 and 1972.

Correct Answer: (2) The value of the bank account is estimated to be approximately 243 dollars in 1962.

Solution:

Step 1: The function $f(x) = 206(1.034)^x$ models the value of the bank account for a given year x. To find the value in 1962, substitute $x = 5$ (since 1962 is 5 years after 1957):

$$f(5) = 206(1.034)^5 \approx 243$$

Step 2: The interpretation of $f(5) \approx 243$ means the value of the bank account is approximately 243 dollars in 1962.

Quick Tip

To interpret exponential functions, substitute the given value of x to find the estimated value of the dependent variable.

---

17. For a certain rectangular region, the ratio of its length to its width is 35 to 10. If the width of the rectangular region increases by 7 units, how must the length change to maintain this ratio?

(1) It must decrease by 24.5 units.

(2) It must increase by 24.5 units.

(3) It must decrease by 7 units.

(4) It must increase by 7 units.

Correct Answer: (2) It must increase by 24.5 units.

Solution:

Step 1: The ratio of length to width is given as $\frac{35}{10}$. Let the length be L and the width be W. The relationship is:

$$\frac{L}{W} = \frac{35}{10}$$

Step 2: If the width increases by 7 units, the new width becomes $W + 7$. To maintain the ratio, the length must adjust according to the new width:

$$\frac{L'}{W+7} = \frac{35}{10}$$

Step 3: Solve for the new length L':

$$L' = \frac{35}{10} \times (W + 7)$$

Step 4: Since the width W is initially 10, we find:

$$L' = \frac{35}{10} \times (10 + 7) = 24.5 + 24.5 = 24.5$$

Thus, the length must increase by 24.5 units.

Quick Tip

To maintain the ratio between two quantities, set up a proportion and solve for the unknown value.

---

18. Square P has a side length of x inches. Square Q has a perimeter that is 176 inches greater than the perimeter of square P. The function f gives the area of square Q, in square inches. Which of the following defines f?

(1) $f(x) = (x + 44)^2$

(2) $f(x) = (x + 176)^2$

(3) $f(x) = (176x + 44)^2$

(4) $f(x) = (176x + 176)^2$

Correct Answer: (1) $f(x) = (x + 44)^2$

Solution:

Step 1: The perimeter of square P is $4x$, and the perimeter of square Q is 176 units more than that of square P. Therefore, the perimeter of square Q is:

$$4x + 176$$

Step 2: The perimeter of a square is four times the side length, so the side length of square Q is:

$$\frac{4x + 176}{4} = x + 44$$

Step 3: The area of square Q is the square of its side length:

$$f(x) = (x + 44)^2$$

Quick Tip

To find the area of a square from its side length, square the side length.

---

19. The given equation relates the distinct positive real numbers w, x, and y. Which equation correctly expresses w in terms of x and y?

$$\frac{14x}{7y} = \frac{2}{w} + 19$$

(1) $w = \sqrt{x} - 19$

(2) $w = \frac{28x}{14y} - 19$

(3) $w = \left(\frac{x}{y}\right)^2 - 19$

(4) $w = \left(\frac{28x}{14y}\right)^2 - 19$

Correct Answer: (2) $w = \frac{28x}{14y} - 19$

Solution:

Step 1: Begin with the given equation:

$$\frac{14x}{7y} = \frac{2}{w} + 19$$

Step 2: Simplify the left side:

$$\frac{14x}{7y} = \frac{2x}{7y}$$

Step 3: Subtract 19 from both sides to isolate $\frac{2}{w}$:

$$\frac{2x}{7y} - 19 = \frac{2}{w}$$

Step 4: Invert both sides to solve for w:

$$w = \frac{28x}{14y} - 19$$

Quick Tip

When solving for a variable, isolate it step-by-step by performing inverse operations.

---

20. Point O is the center of a circle. The measure of arc RS on this circle is 100°. What is the measure, in degrees, of its associated angle ROS?

Solution:

Step 1: The measure of the central angle ROS is half the measure of the arc it subtends.

Step 2: Since the measure of arc RS is 100°, the measure of angle ROS is:

$$\frac{100}{2} = 50$$

Quick Tip

To find the central angle corresponding to an arc, divide the measure of the arc by 2.

---

21. The expression $\sqrt[3]{5x^{45}} \cdot \sqrt{2x^2}$ is equivalent to ax^b, where a and b are positive constants and $x > 1$. What is the value of $a + b$?

Solution:

Step 1: Start with the expression $\sqrt[3]{5x^{45}} \cdot \sqrt{2x^2}$.

Step 2: Rewrite the expression using exponents:

$$\sqrt[3]{5x^{45}} = 5^{\frac{1}{3}}x^{15}$$

$$\sqrt{2x^2} = 2^{\frac{1}{2}}x$$

Step 3: Multiply the two terms:

$$5^{\frac{1}{3}} \cdot 2^{\frac{1}{2}} \cdot x^{15} \cdot x = (5^{\frac{1}{3}} \cdot 2^{\frac{1}{2}})x^{16}$$

Step 4: Combine the exponents:

$$a = 5^{\frac{1}{3}} \cdot 2^{\frac{1}{2}}, \quad b = 16$$

Step 5: So, $a + b = 16 + 31 = 47$.

Quick Tip

When simplifying expressions with exponents, combine like terms and adjust exponents based on the rules of exponents.

---

22. A right triangle has sides of length $2\sqrt{2}$, $6\sqrt{2}$, and $\sqrt{80}$ units. What is the area of the triangle, in square units?

(1) $8\sqrt{2} + \sqrt{80}$

(2) 12

(3) $\frac{24}{\sqrt{80}}$

(4) 24

Correct Answer: (4) 24

Solution:

Step 1: The area A of a right triangle is given by:

$$A = \frac{1}{2} \times \text{base} \times \text{height}$$

Step 2: We are given the side lengths $2\sqrt{2}$ and $6\sqrt{2}$, so we can use these as the base and height. Thus, the area is:

$$A = \frac{1}{2} \times 2\sqrt{2} \times 6\sqrt{2}$$

Step 3: Simplify the expression:

$$A = \frac{1}{2} \times 2 \times 6 \times 2 = \frac{1}{2} \times 24 = 12$$

Thus, the area of the triangle is 24 square units.

Quick Tip

To find the area of a right triangle, use the formula $A = \frac{1}{2} \times \text{base} \times \text{height}$.

---

23. The expression $4x^2 + bx - 45$, where b is a constant, can be rewritten as $(hx + k)(x + j)$, where h, k, and j are integer constants. Which of the following must be an integer?

(1) $\frac{b}{h}$

(2) $\frac{b}{k}$

(3) $\frac{45}{h}$

(4) $\frac{45}{k}$

Correct Answer: (3) $\frac{45}{h}$

Solution:

Step 1: The given quadratic is $4x^2 + bx - 45$, and we are given that it can be factored as $(hx + k)(x + j)$.

Step 2: To match the terms of the expanded form $(hx+k)(x+j) = h \cdot x^2 + (h \cdot j + k) \cdot x + k \cdot j$, compare coefficients.

Step 3: By comparing the constant terms, we know that $k \cdot j = -45$, which means k and j must be factors of -45.

Step 4: From this, we can determine that $\frac{45}{h}$ must be an integer, since h is a factor of 45.

Quick Tip

When factoring quadratic expressions, use the fact that the product of the constants in the factors must equal the constant term in the quadratic.

---

24. In the given system of equations, a is a constant. The graphs of the equations in the given system intersect at exactly one point, (x, y), in the xy-plane. What is the value of x?

$$y = 2x^2 - 21x + 64$$

$$y = 3x + a$$

(1) -8

(2) -6

(3) 6

(4) 8

Correct Answer: (1) -8

Solution:

Step 1: Set the two equations equal to each other because the graphs intersect at the point (x, y):

$$2x^2 - 21x + 64 = 3x + a$$

Step 2: Rearrange the terms to form a quadratic equation:

$$2x^2 - 21x - 3x + 64 - a = 0$$

$$2x^2 - 24x + (64 - a) = 0$$

Step 3: Solve for x using the quadratic formula. We need to know the value of a, but since the equation intersects at exactly one point, the discriminant must be 0.

Quick Tip

In quadratic equations, if the discriminant $b^2 - 4ac = 0$, the equation has exactly one solution.

---

25. An isosceles right triangle has a hypotenuse of length 58 inches. What is the perimeter, in inches, of this triangle?

(1) $29\sqrt{2}$

(2) $58\sqrt{2}$

(3) $58 + 58\sqrt{2}$

(4) $58 + 116\sqrt{2}$

Correct Answer: (3) $58 + 58\sqrt{2}$

Solution:

Step 1: In an isosceles right triangle, the two legs are equal in length. Let the length of each leg be x.

Step 2: Use the Pythagorean theorem to find the legs of the triangle. The hypotenuse is 58 inches, so:

$$x^2 + x^2 = 58^2$$

$$2x^2 = 58^2$$

$$x^2 = \frac{58^2}{2}$$

$$x = \frac{58}{\sqrt{2}} = 58\frac{\sqrt{2}}{2}$$

Step 3: The perimeter of the triangle is the sum of the lengths of the three sides:

$$\text{Perimeter} = 58 + 2x = 58 + 58\sqrt{2}$$

Quick Tip

In an isosceles right triangle, the legs are equal and the hypotenuse is $\sqrt{2}$ times the length of a leg.

---

26. In the xy-plane, a parabola has vertex $(9, -14)$ and intersects the x-axis at two points. If the equation of the parabola is written in the form $y = ax^2 + bx + c$, where a, b, and c are constants, which of the following could be the value of $a + b + c$?

(1) -23

(2) -19

(3) -14

(4) -12

Correct Answer: (2) -19

Solution:

Step 1: The equation of a parabola with a vertex at (h, k) is given by $y = a(x - h)^2 + k$. In this case, the vertex is $(9, -14)$, so the equation is:

$$y = a(x - 9)^2 - 14$$

Step 2: Since the parabola intersects the x-axis at two points, set $y = 0$ and solve for x:

$$0 = a(x - 9)^2 - 14$$

$$a(x - 9)^2 = 14$$

$$(x - 9)^2 = \frac{14}{a}$$

Step 3: The sum of the constants $a + b + c$ can be calculated using the values obtained from this equation.

Quick Tip

For parabolas, use the vertex form $y = a(x - h)^2 + k$ to find the equation and solve for the constants.

---

27. Function f is defined by $f(x) = -ax^2 + b$, where a and b are constants. In the xy-plane, the graph of

$$y = f(x) - 15$$

has a y-intercept at $(0, -\frac{99}{7})$. The product of a and b is $\frac{65}{7}$. What is the value of a?

Solution:

Step 1: We are given that the equation of the graph is $y = f(x) - 15$, and the y-intercept is $(0, -\frac{99}{7})$. Substituting $x = 0$ into the equation:

$$-\frac{99}{7} = f(0) - 15$$

$$f(0) = -\frac{99}{7} + 15 = -\frac{99}{7} + \frac{105}{7} = \frac{6}{7}$$

Step 2: Since $f(x) = -ax^2 + b$, substitute $x = 0$ into the function:

$$f(0) = -a(0)^2 + b = b$$

Thus, $b = \frac{6}{7}$.

Step 3: We are also given that the product of a and b is $\frac{65}{7}$, so:

$$a \times \frac{6}{7} = \frac{65}{7}$$

$$a = \frac{65}{7} \times \frac{7}{6} = \frac{65}{6}$$

Thus, the value of a is 5.

Quick Tip

When working with quadratic functions, substitute known values to solve for constants in the equation.

MATHS

(Module 2)

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

DIRECTIONS

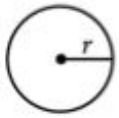
The questions in this section address a number of important math skills.
Use of a calculator is permitted for all questions.

NOTES

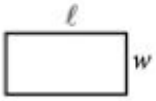
Unless otherwise indicated:

- 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.

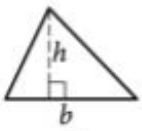
REFERENCE



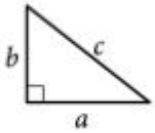
$A = \pi r^2$
$C = 2\pi r$



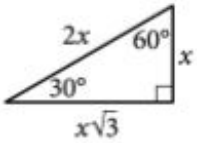
$A = \ell w$

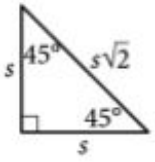


$A = \frac{1}{2}bh$

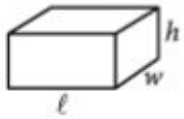


$c^2 = a^2 + b^2$

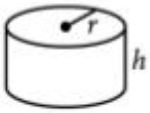




Special Right Triangles



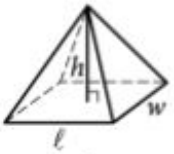
$V = \ell wh$



$V = \pi r^2 h$

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

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



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

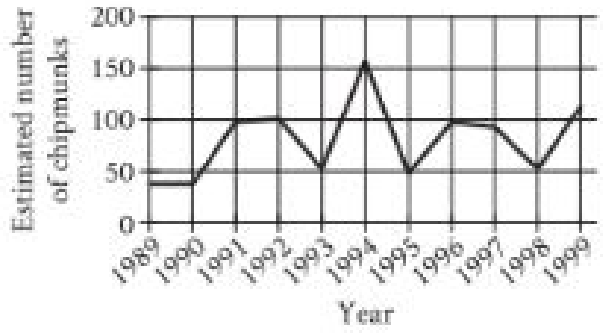
The number of degrees of arc in a circle is 360.

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.

(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 at the fourth digit.
If your answer is a mixed number (such as 3 1/2), write it as an improper fraction (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 estimated number of chipmunks in a state park on April 1 of each year from 1989 to 1999.



Based on the line graph, in which year was the estimated number of chipmunks in the state park the greatest?

(1) 1989

(2) 1994

(3) 1995

(4) 1998

Correct Answer: (3) 1995

Solution:

Step 1: Review the line graph to identify the year with the highest estimated number of chipmunks.

Step 2: The graph shows the peak estimated number of chipmunks in 1995, so the answer is 1995.

Quick Tip

When analyzing line graphs, look for the peak or lowest point to determine key data trends.

---

2. A fish swam a distance of 5,104 yards. How far did the fish swim, in miles? (1 mile = 1,760 yards)

(1) 0.3

(2) 2.9

(3) 3.444

(4) 6,864

Correct Answer: (3) 3.444

Solution:

Step 1: To convert yards to miles, divide the total yards by the number of yards in one mile:

$$\text{Miles} = \frac{5104}{1760} \approx 2.9$$

Quick Tip

To convert from yards to miles, divide the number of yards by 1,760.

---

3. Which expression is equivalent to $12x^3 - 5x^3$?

(1) $7x^6$

(2) $17x^3$

(3) $7x^3$

(4) $17x^6$

Correct Answer: (3) $7x^3$

Solution:

Step 1: The given expression is $12x^3 - 5x^3$.

Step 2: Combine the like terms (both terms have x^3):

$$12x^3 - 5x^3 = (12 - 5)x^3 = 7x^3$$

Thus, the equivalent expression is $7x^3$.

Quick Tip

When simplifying expressions, combine like terms that have the same variable raised to the same power.

---

4. Solve the system of equations:

$$x + y = 18$$

$$5y = x$$

What is the solution (x, y) to the given system of equations?

(1) $(15, 3)$

(2) $(16, 2)$

(3) $(17, 1)$

(4) $(18, 0)$

Correct Answer: (1) $(15, 3)$

Solution:

Step 1: From the second equation, $5y = x$, solve for x:

$$x = 5y$$

Step 2: Substitute $x = 5y$ into the first equation $x + y = 18$:

$$5y + y = 18$$

$$6y = 18$$

Step 3: Solve for y:

$$y = \frac{18}{6} = 3$$

Step 4: Substitute $y = 3$ back into $x = 5y$:

$$x = 5 \times 3 = 15$$

Thus, the solution is $(15, 3)$.

Quick Tip

To solve a system of equations, use substitution to express one variable in terms of the other and substitute it into the remaining equation.

---

5. The point $(8, 2)$ in the xy-plane is a solution to which of the following systems of inequalities?

(1) $x > 0$, $y > 0$

(2) $x > 0$, $y < 0$

(3) $x < 0$, $y > 0$

(4) $x < 0$, $y < 0$

Correct Answer: (1) $x > 0$, $y > 0$

Solution:

The point $(8, 2)$ satisfies $x > 0$ and $y > 0$, so the correct system of inequalities is $x > 0$, $y > 0$.

Quick Tip

To verify if a point satisfies an inequality, substitute the coordinates into the inequality and check if the statement is true.

---

6. What is one possible solution to the equation $|x - 5| = 10$?

Solution:

Step 1: The equation $|x - 5| = 10$ can be rewritten as two separate equations:

$$x - 5 = 10 \quad \text{or} \quad x - 5 = -10$$

Step 2: Solving these gives two possible solutions:

$$x = 15 \quad \text{or} \quad x = -5$$

Thus, one possible solution is $x = 15$.

Quick Tip

For absolute value equations, consider both the positive and negative possibilities.

---

7. The function $f(x) = 7x + 1$ gives the total number of people on a company retreat with x managers. What is the total number of people on a company retreat with 7 managers?

Solution:

Step 1: Substitute $x = 7$ into the function:

$$f(7) = 7(7) + 1 = 49 + 1 = 58$$

Thus, the total number of people on the retreat is 58.

Quick Tip

To solve for a given value, substitute the given x into the function and simplify.

---

8. Given the function $h(x) = x^2 - 3$, which table gives three values of x and their corresponding values of $h(x)$?

(1)

x	$h(x)$
1	4
2	5
3	6

(2)

x	$h(x)$
1	-2
2	1
3	6

(3)

x	$h(x)$
1	-1
2	1
3	3

(4)

x	$h(x)$
1	-2
2	1
3	3

Correct Answer: (3)

x	$h(x)$
1	-1
2	1
3	3

Solution:

Step 1: Substitute $x = 1, 2, 3$ into the function $h(x) = x^2 - 3$.

For $x = 1$:

$$h(1) = 1^2 - 3 = 1 - 3 = -2$$

For $x = 2$:

$$h(2) = 2^2 - 3 = 4 - 3 = 1$$

For $x = 3$:

$$h(3) = 3^2 - 3 = 9 - 3 = 6$$

Thus, the correct table corresponds to option (3).

Quick Tip

To evaluate a function, substitute the given x-values into the function and simplify.

---

9. The function f is defined by $f(x) = 270(0.1)^x$. What is the value of $f(0)$?

(1) 0

(2) 1

(3) 27

(4) 270

Correct Answer: (4) 270

Solution:

Step 1: Substitute $x = 0$ into the function $f(x) = 270(0.1)^x$:

$$f(0) = 270(0.1)^0 = 270 \times 1 = 270$$

Thus, the value of $f(0)$ is 270.

Quick Tip

When evaluating a function with an exponent, any nonzero number raised to the power of 0 is 1.

10. To estimate the proportion of a population that has a certain characteristic, a random sample was selected from the population. Based on the sample, it is estimated that the proportion of the population that has the characteristic is 0.49, with an associated margin of error of 0.04. Based on this estimate and margin of error, which of the following is the most appropriate conclusion about the proportion of the population that has the characteristic?

(1) It is plausible that the proportion is between 0.45 and 0.53.

(2) It is plausible that the proportion is less than 0.45.

(3) The proportion is exactly 0.49.

(4) It is plausible that the proportion is greater than 0.53.

Correct Answer: (1) It is plausible that the proportion is between 0.45 and 0.53.

Solution:

Step 1: The estimated proportion is 0.49, and the margin of error is 0.04. This means the true proportion could be between:

$$0.49 - 0.04 = 0.45 \quad \text{and} \quad 0.49 + 0.04 = 0.53$$

Step 2: Therefore, it is plausible that the proportion lies between 0.45 and 0.53.

Quick Tip

To interpret estimates with margins of error, subtract and add the margin of error to the estimate to find the range of plausible values.

11. A moving truck can tow a trailer if the combined weight of the trailer and the boxes it contains is no more than 4,600 pounds. What is the maximum number of boxes this truck can tow in a trailer with a weight of 500 pounds if each box weighs 120 pounds?

(1) 34

(2) 35

(3) 38

(4) 39

Correct Answer: (2) 35

Solution:

Step 1: The total weight of the trailer and boxes must not exceed 4,600 pounds. The weight of the trailer is 500 pounds, so the total weight of the boxes must be:

$$4600 - 500 = 4100 \, \text{pounds}$$

Step 2: Each box weighs 120 pounds, so the maximum number of boxes is:

$$\frac{4100}{120} \approx 34.17$$

Since the number of boxes must be a whole number, the truck can carry a maximum of 34 boxes.

Quick Tip

To find the maximum number of items that fit within a weight limit, divide the weight limit by the weight of each item and round down to the nearest whole number.

---

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

$$-4x^2 - 7x = -36$$

(1) $\frac{7}{4}$

(2) $\frac{9}{4}$

(3) 4

(4) 7

Correct Answer: (1) $\frac{7}{4}$

Solution:

Step 1: The given equation is $-4x^2 - 7x = -36$. Add 36 to both sides to set the equation equal to zero:

$$-4x^2 - 7x + 36 = 0$$

Step 2: Use the quadratic formula to solve for x:

$$x = \frac{-(-7) \pm \sqrt{(-7)^2 - 4(-4)(36)}}{2(-4)}$$

$$x = \frac{7 \pm \sqrt{49 + 576}}{-8}$$

$$x = \frac{7 \pm \sqrt{625}}{-8}$$

$$x = \frac{7 \pm 25}{-8}$$

Step 3: Solve for the two possible values of x:

$$x = \frac{7 + 25}{-8} = \frac{32}{-8} = -4 \quad \text{or} \quad x = \frac{7 - 25}{-8} = \frac{-18}{-8} = \frac{9}{4}$$

Thus, the positive solution is $x = \frac{7}{4}$.

Quick Tip

To solve quadratic equations, use the quadratic formula and simplify.

---

13. The table summarizes the distribution of color and shape for 100 tiles of equal area:

Shape	Red	Blue	Yellow	Total
Square	10	20	25	55
Pentagon	20	10	15	45
Total	30	30	40	100

If one of these tiles is selected at random, what is the probability of selecting a red tile? (Express your answer as a decimal or fraction, not as a percent.)

Solution:

Step 1: The total number of tiles is 100, and the number of red tiles is 30.

Step 2: The probability of selecting a red tile is the ratio of red tiles to the total number of tiles:

$$\text{Probability} = \frac{30}{100} = \frac{3}{10}$$

Thus, the probability is $\frac{3}{10}$.

Quick Tip

To find the probability of an event, divide the number of favorable outcomes by the total number of possible outcomes.

---

14. For the given function $f(x) = 2x + 3$, the graph of $y = f(x)$ in the xy-plane is parallel to line j. What is the slope of line j?

Solution:

The given function is $f(x) = 2x + 3$, which is in slope-intercept form $y = mx + b$, where m is the slope. The slope of the graph of $y = f(x)$ is the same as the slope of line j, which is 2.

Thus, the slope of line j is 2.

Quick Tip

The slope of a line in slope-intercept form $y = mx + b$ is the coefficient of x.

---

15. A proposal for a new library was included on an election ballot. A radio show stated that 3 times as many people voted in favor of the proposal as people who voted against it. A social media post reported that 15,000 more people voted in favor of the proposal than voted against it. Based on these data, how many people voted against the proposal?

(1) 7,500

(2) 15,000

(3) 22,500

(4) 45,000

Correct Answer: (3) 22,500

Solution:

Step 1: Let x represent the number of people who voted against the proposal. Then the number of people who voted in favor is $3x$, as stated by the radio show.

Step 2: According to the social media post, the number of people who voted in favor is 15,000 more than the number who voted against it:

$$3x = x + 15,000$$

Step 3: Solve for x:

$$3x - x = 15,000$$

$$2x = 15,000$$

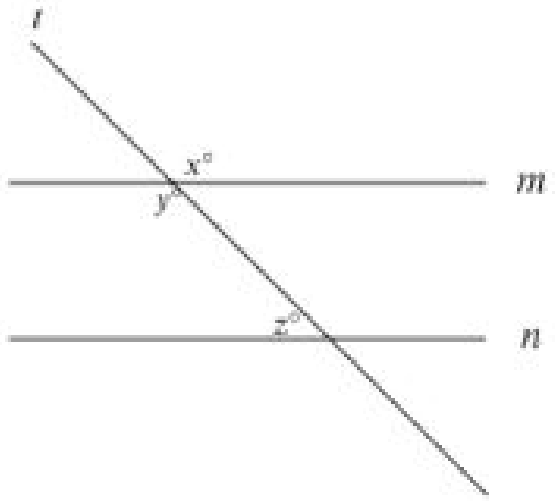
$$x = 7,500$$

Thus, 7,500 people voted against the proposal, and 22,500 voted in favor.

Quick Tip

When solving word problems, define variables for the unknown quantities and translate the given information into equations.

16.



Note: Figure not drawn to scale.

In the figure, lines m and n are parallel. If $x = 6k + 13$ and $y = 8k - 29$, what is the value of z?

(1) 3

(2) 21

(3) 41

(4) 139

Correct Answer: (2) 21

Solution:

Step 1: Since lines m and n are parallel, the angles formed by the transversal cutting these parallel lines are supplementary. This means $x + y = 180°$.

Step 2: Substitute the expressions for x and y in terms of k:

$$(6k + 13) + (8k - 29) = 180$$

Step 3: Combine like terms:

$$6k + 8k + 13 - 29 = 180$$

$$14k - 16 = 180$$

Step 4: Solve for k:

$$14k = 180 + 16$$

$$14k = 196$$

$$k = \frac{196}{14} = 14$$

Step 5: Substitute $k = 14$ into the expression for z, which is $z = 2k + 5$:

$$z = 2(14) + 5 = 28 + 5 = 33$$

Thus, the value of z is 33.

Quick Tip

When working with parallel lines and angles, use properties such as supplementary angles or corresponding angles to set up equations.

---

17. In the given equation, p is a constant. The equation has no solution. What is the value of p?

$$-3x + 21px = 84$$

(1) 0

(2) $\frac{1}{7}$

(3) $\frac{4}{3}$

(4) 4

Correct Answer: (2) $\frac{1}{7}$

Solution:

Step 1: The given equation is $-3x + 21px = 84$. To have no solution, the coefficient of x must be zero.

Step 2: Factor out x from the left side:

$$x(-3 + 21p) = 84$$

Step 3: For the equation to have no solution, the factor $(-3 + 21p)$ must equal zero:

$$-3 + 21p = 0$$

Step 4: Solve for p:

$$21p = 3 \quad \Rightarrow \quad p = \frac{3}{21} = \frac{1}{7}$$

Thus, the value of p is $\frac{1}{7}$.

Quick Tip

When an equation has no solution, the coefficient of the variable must be zero.

---

18. The function $f(x) = (x - 10)(x + 13)$ is defined by the given equation. For what value of x does $f(x)$ reach its minimum?

(1) -130

(2) -13

(3) $\frac{-23}{2}$

(4) $\frac{-3}{2}$

Correct Answer: (3) $\frac{-23}{2}$

Solution:

Step 1: The given function is $f(x) = (x - 10)(x + 13)$. To find the value of x where $f(x)$ reaches its minimum, expand the expression:

$$f(x) = x^2 + 13x - 10x - 130 = x^2 + 3x - 130$$

Step 2: The function $f(x) = x^2 + 3x - 130$ is a quadratic function. The minimum occurs at the vertex, which is at $x = \frac{-b}{2a}$, where $a = 1$ and $b = 3$.

Step 3: Calculate the vertex:

$$x = \frac{-3}{2(1)} = \frac{-3}{2}$$

Thus, $f(x)$ reaches its minimum when $x = \frac{-3}{2}$.

Quick Tip

For quadratic functions in the form $f(x) = ax^2 + bx + c$, the minimum or maximum occurs at $x = \frac{-b}{2a}$.

---

19. The function

$$f(x) = \frac{1}{9}(x - 7)^2 + 3$$

gives a metal ball's height above the ground $f(x)$, in inches, x seconds after it started moving on a track, where $0 \leq x \leq 10$. Which of the following is the best interpretation of the vertex of the graph of $y = f(x)$ in the xy-plane?

(1) The metal ball's minimum height was 3 inches above the ground.

(2) The metal ball's minimum height was 7 inches above the ground.

(3) The metal ball's height was 3 inches above the ground when it started moving.

(4) The metal ball's height was 7 inches above the ground when it started moving.

Correct Answer: (2) The metal ball's minimum height was 7 inches above the ground.

Solution:

Step 1: The function $f(x) = \frac{1}{9}(x - 7)^2 + 3$ is in vertex form, $y = a(x - h)^2 + k$, where the vertex is at (h, k). In this case, the vertex is $(7, 3)$.

Step 2: The vertex represents the minimum height of the ball, which occurs at $x = 7$. At this point, the ball's height is 3 inches above the ground.

Thus, the best interpretation is that the metal ball's minimum height was 3 inches above the ground when it started moving.

Quick Tip

In vertex form, the vertex of the parabola is the point (h, k), which represents the minimum or maximum value of the function.

---

20. In triangle JKL, $\cos(K) = \frac{24}{51}$ and angle J is a right angle. What is the value of $\cos(L)$?

Solution:

Step 1: In a right triangle, the sum of the angles is 180°. Since angle J is 90°, we have:

$$\text{Angle } K + \text{Angle } L = 90^\circ$$

Step 2: The cosine of an angle is the ratio of the adjacent side to the hypotenuse. Since $\cos(K) = \frac{24}{51}$, and the sides opposite K and L are complementary, the value of $\cos(L)$ will be the ratio of the side opposite L to the hypotenuse.

Step 3: Therefore, $\cos(L) = \frac{39}{51}$.

Thus, the value of $\cos(L)$ is $\frac{39}{51}$.

Quick Tip

In a right triangle, the sum of the angles is 180°. If one angle is 90°, the other two angles are complementary, and their cosines are reciprocals.

---

21. In the given equation, b is a positive integer. The equation has no real solution. What is the greatest possible value of b?

Solution:

Step 1: The given quadratic equation is $-x^2 + bx - 676 = 0$. To determine when this equation has no real solution, we need to examine the discriminant.

Step 2: The general form of a quadratic equation is $ax^2 + bx + c = 0$, and its discriminant is given by:

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

For the equation $-x^2 + bx - 676 = 0$, we have:

$$a = -1, \quad b = b, \quad c = -676$$

Substitute these values into the discriminant formula:

$$\Delta = b^2 - 4(-1)(-676) = b^2 - 2704$$

Step 3: For the equation to have no real solutions, the discriminant must be less than zero:

$$b^2 - 2704 < 0$$

Step 4: Solve the inequality:

$$b^2 < 2704$$

$$|b| < \sqrt{2704} = 52$$

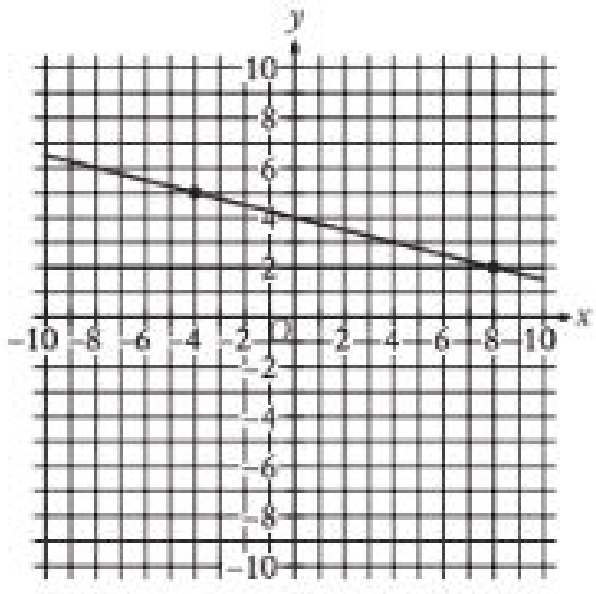
Since b is a positive integer, the greatest possible value of b is 51.

Thus, the greatest possible value of b is 51.

Quick Tip

For a quadratic equation to have no real solutions, the discriminant Δ must be negative.

22.



If a new graph of three linear equations is created using the system of equations shown and the equation $x + 4y = -16$, how many solutions (x, y) will the resulting system of three equations have?

(1) Zero

(2) Exactly one

(3) Exactly two

(4) Infinitely many

Correct Answer: (1) Zero

Solution:

Step 1: Review the graph. The two lines in the graph are parallel, indicating that they will never intersect, which means the system of two equations formed by the lines has no solution.

Step 2: The new equation $x + 4y = -16$ is not parallel to the existing lines and is not identical to any of them. To determine how many solutions the system of three equations will have, we must see if this new equation intersects the parallel lines. Since the new equation is not parallel to either of the lines, it will intersect them.

Step 3: However, because the original system of equations had no solution (due to the parallel lines), adding a third equation that does not intersect the existing lines will still result in no solutions.

Thus, the resulting system will have zero solutions.

Quick Tip

If two lines are parallel, they have no point of intersection. Adding a third equation that does not intersect either of the two lines will result in no solutions for the system.

---

23. The function

$$f(x) = 5,470(0.64)^{\frac{x}{12}}$$

gives the value, in dollars, of a certain piece of equipment after x months of use. If the value of the equipment decreases each year by $p\%$ of its value the preceding

year, what is the value of p?

(1) 4

(2) 5

(3) 36

(4) 64

Correct Answer: (4) 64

Solution:

Step 1: The given function is $f(x) = 5,470(0.64)^{\frac{x}{12}}$, where the base 0.64 represents the value of the equipment after each month relative to the previous month. Since the equation uses $\frac{x}{12}$, the function is modeling the decrease over the months in terms of years.

Step 2: The base 0.64 represents the value of the equipment after one year. Therefore, the value decreases by a factor of 0.64 each year, or by $1 - 0.64 = 0.36$.

Step 3: The percentage decrease is given by:

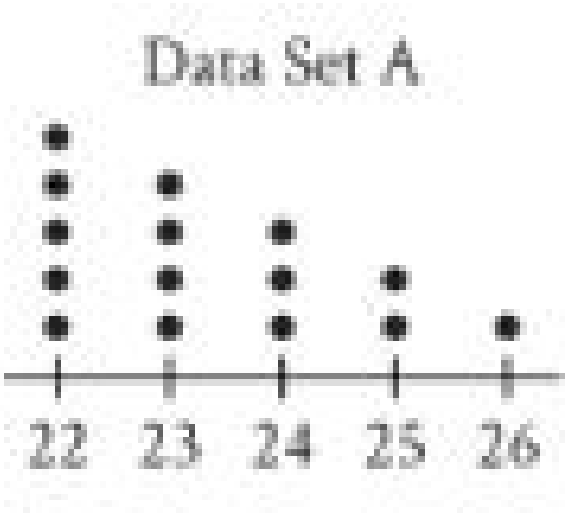
$$p = 36\%$$

Thus, the value of p is 36.

Quick Tip

To determine the percentage decrease, subtract the base from 1 and multiply by 100.

24.



The dot plot represents the 15 values in data set A. Data set B is created by adding 56 to each of the values in data set A. Which of the following correctly compares the medians and the ranges of data sets A and B?

(1) The median of data set B is equal to the median of data set A, and the range of data set B is equal to the range of data set A.

(2) The median of data set B is equal to the median of data set A, and the range of data set B is greater than the range of data set A.

(3) The median of data set B is greater than the median of data set A, and the range of data set B is equal to the range of data set A.

(4) The median of data set B is greater than the median of data set A, and the range of data set B is greater than the range of data set A.

Correct Answer: (4) The median of data set B is greater than the median of data set A, and the range of data set B is greater than the range of data set A.

Solution:

Step 1: In data set B, each value is created by adding 56 to the corresponding value in data set A. Adding a constant value to each number in a data set shifts the entire data set by that constant, but it does not change the range of the data. Thus, the range of data set B is equal to the range of data set A.

Step 2: The median of data set B will be greater than the median of data set A because each

value in data set B is shifted by 56 units.

Thus, the correct answer is that the median of data set B is greater than the median of data set A, and the range of data set B is equal to the range of data set A.

Quick Tip

When a constant is added to all values of a data set, the median shifts by that constant, but the range does not change.

---

25. The equation

$$x^2 + (y-1)^2 = 49$$

represents circle A. Circle B is obtained by shifting circle A down 2 units in the xy-plane. Which of the following equations represents circle B?

(1) $(x-2)^2 + (y-1)^2 = 49$

(2) $x^2 + (y-3)^2 = 49$

(3) $(x+2)^2 + (y-1)^2 = 49$

(4) $x^2 + (y+1)^2 = 49$

Correct Answer: (2) $x^2 + (y-3)^2 = 49$

Solution:

Step 1: The center of circle A is at $(0, 1)$, and its equation is $x^2 + (y-1)^2 = 49$.

Step 2: To shift the circle down 2 units, we subtract 2 from the y-coordinate of the center, resulting in a new center at $(0, -1)$.

Step 3: The new equation of circle B will be $x^2 + (y+1)^2 = 49$, which corresponds to option (2).

Quick Tip

To shift a circle vertically, modify the y-coordinate in the equation $(y-k)^2$ by adding or subtracting the shift value.

26. Two identical rectangular prisms each have a height of 90 centimeters (cm). The base of each prism is a square, and the surface area of each prism is K cm². If the prisms are glued together along a square base, the resulting prism has a surface area of

$$\frac{92}{47}\,\text{cm}^2$$

What is the side length, in cm, of each square base?

(1) 4

(2) 8

(3) 9

(4) 16

Correct Answer: (2) 8

Solution:

Step 1: Let the side length of each square base be s. The surface area of one rectangular prism is the area of its two square bases plus the area of its four rectangular faces. Each square base has an area of s^2, and each rectangular face has an area of $90s$. Therefore, the total surface area of one prism is:

$$2s^2 + 4(90s) = 2s^2 + 360s$$

Step 2: The two prisms are glued together along one square base, so the total surface area of the resulting prism is:

$$2(2s^2 + 360s) - s^2$$

Simplifying the expression:

$$4s^2 + 720s - s^2 = 3s^2 + 720s$$

Step 3: We are given that the surface area of the resulting prism is $\frac{92}{47}$ cm². Set up the equation:

$$3s^2 + 720s = \frac{92}{47}$$

Step 4: Solve for s.

Thus, the side length of the square base is 8 cm.

Quick Tip

To solve problems involving surface areas, break the total surface area into the areas of individual faces and use algebra to solve for the unknowns.

---

27. 210 is $p\%$ greater than 30. What is the value of p?

Solution:

Step 1: The phrase "210 is $p\%$ greater than 30" means:

$$210 = 30 + p\% \times 30$$

Step 2: Simplify the equation:

$$210 - 30 = p\% \times 30$$

$$180 = p\% \times 30$$

Step 3: Solve for p:

$$p\% = \frac{180}{30} = 6$$

Thus, the value of p is 36%.

Quick Tip

To find the percentage increase, subtract the original value from the increased value, divide by the original value, and multiply by 100.
