The SAT®

Practice Test #7

ANSWER EXPLANATIONS

These answer explanations are for students taking the digital SAT in nondigital format.

SAT®

Reading and Writing

Module 1
(33 questions)

QUESTION 1

Choice A is the best answer because it most logically completes the text's discussion of a prediction about a kilonova. In this context, a "theory" is an explanation that is considered scientifically acceptable. The text states that astronomers predicted in the 1990s that a collision between a black hole and a neutron star or between two neutron stars could release a massive gamma ray burst called a kilonova, explaining that they determined this possibility based on their extensive work with existing data and simulations ("calculations and models"). In other words, the prediction was a theory—a well-supported explanation—that, as the text indicates, was later confirmed with observations in 2017.

Choice B is incorrect because the text indicates that it is the prediction made by astronomers in the 1990s that was confirmed in 2017, and a prediction of an event isn't "evidence," or proof, of that event's existence, even when the prediction is based on extensive study. Further, there would be no need for later confirmation of something that was already recognized as evidence. *Choice C* is incorrect because in this context, a "constant" is a situation or factor that doesn't change. The text indicates that it is the prediction made by astronomers in the 1990s that was confirmed in 2017, and there is no reason to describe the prediction as a constant because the text doesn't suggest that the prediction was completely unchanged over time—it addresses only the making of the prediction and its later confirmation. *Choice D* is incorrect because the text indicates that it is the prediction made by astronomers in the 1990s that was confirmed in 2017; although a prediction might be informed by an "experiment," or a controlled test, a prediction is an idea rather than a test.

QUESTION 2

Choice D is the best answer because as used in the text, "clear" most nearly means transparent, or see-through. Muir states that the water beneath the boat "was so clear that it was almost invisible," suggesting that those on the boat were able to see through the water and easily observe plants and fish below the surface.

Choice A is incorrect. In some contexts "clear" can mean "simple," or uncomplicated, but Muir is describing the water, and water isn't typically described as either simple or complicated. Muir emphasizes the water's transparency, not its simplicity. *Choice B* is incorrect. In some contexts "clear" can mean "understandable," or reasonable or easily comprehended, but Muir is describing the water, and it doesn't make much sense to describe water as understandable. Muir emphasizes the water's transparency, not how easily the water can be understood. *Choice C* is incorrect. Although "clear" can mean "obvious," or easily seen or understood, in some contexts, Muir's description emphasizes that the water "was almost invisible" and that the boat seemed to be "sustained in the air," suggesting that the water was almost impossible to see, not that it was obvious.

QUESTION 3

Choice B is the best answer because it most logically completes the text's discussion of how Maggie Lena Walker addressed the lack of financial services available to Black residents in Richmond, Virginia, at the turn of the twentieth century. In this context, "rectify" means to correct or remedy something undesirable. The text indicates that by chartering the St. Luke Penny Savings Bank in 1903, Walker took action to provide local Black residents with greater access to financial services like home loans and savings opportunities. This context supports the idea that she aimed to rectify the undesirable situation affecting these residents.

Choice A is incorrect because in this context, "prolong" would mean to lengthen something in time. The text indicates that at the turn of the twentieth century, Black residents in Richmond, Virginia, were faced with a lack of formal banking options. The text then states that Walker founded a new bank that provided these residents with financial services. Therefore, instead of prolonging the situation, she took steps to rectify, or correct, it. *Choice C* is incorrect because in this context, "retain" would mean to continue to have or to keep something. According to the text, at the turn of the twentieth century, Black residents in Richmond, Virginia, had few formal banking options, and Walker chartered a new institution to provide these residents with expanded financial services; therefore, she took steps to rectify, not retain, the situation. *Choice D* is incorrect because in this context, "highlight" would mean to emphasize or call attention to something, but the text indicates that Walker took concrete steps beyond merely drawing attention to the situation Black residents were facing in Richmond, Virginia, at the turn of the twentieth century. According to the text, Walker worked to rectify, or correct, the lack of formal banking options that were available to these residents by establishing a bank that provided them with home loans and savings opportunities.

QUESTION 4

Choice B is the best answer because it most logically completes the text's discussion of a relationship between the results of randomized clinical tests of how effective common medical interventions are and the conclusions practitioners reach about such interventions in real-world settings. In this context, "corroborate" means confirm or support with evidence. The text indicates that one possible explanation for the relationship being discussed is that practitioners may overlook confounding variables—that is, additional factors other than the medical interventions being investigated that affect the observed outcomes. This means that practitioners may assume that an outcome is the direct result of a medical intervention when it is actually the result of a combination of factors. Clinical trials take steps to rule out factors other than the one being studied, so if those extra factors are actually having an effect on real-world outcomes, the trials are likely to produce conclusions different from those practitioners reach in their real-world observations. In other words, clinical trials may fail to corroborate practitioners' conclusions.

Choice A is incorrect because it wouldn't make sense to say that the results of clinical trials could "circumvent," or find a way around or bypass, conclusions practitioners reach in real-world scenarios with patients; it's possible that researchers conducting the trials might avoid engaging with practitioners' conclusions, but findings from a study can't choose to get around something. *Choice C* is incorrect because it wouldn't make sense to say that the results of clinical trials could "disseminate," or spread widely, conclusions practitioners reach in real-world scenarios with patients; the researchers conducting the trials might choose to draw attention to practitioners' conclusions, but findings from a study can't spread anything. *Choice D* is incorrect because it wouldn't make sense to say that the results of clinical trials could "implement," or put into effect, conclusions practitioners reach in real-world scenarios with patients; the researchers conducting the trials might consider practitioners' conclusions, but findings from a study can't put anything into effect.

QUESTION 5

Choice A is the best answer because it most logically completes the text's discussion of diadromous fish. In this context, "demarcated from" means separate or set apart from. The text indicates that diadromous fish differ from euryhaline fish in that diadromous fish "migrate between freshwater and marine biomes during their life," whereas euryhaline fish do not relocate to a different biome because they can tolerate higher salinity environments. Therefore, this context suggests that because of differences between their migration patterns, diadromous fish are distinct and can be demarcated from euryhaline fish.

Choice B is incorrect. Although the text states that diadromous fish migrate and relocate, the text does not suggest that diadromous fish would be "reconstituted as," or formed again as, anything new. Only their environments change and not the fish themselves. *Choice C* is incorrect because the text does not suggest that diadromous fish can be "conflated with," or combined with, euryhaline fish. Instead, the text distinguishes the two types of fish by pointing out their

differences with regard to migration and tolerance for salinity. *Choice D* is incorrect because the text indicates that based on migration habits and tolerance for salinity, diadromous fish are different from euryhaline fish; so it would not make logical sense to say that diadromous fish would be "derived from," or be an extension of or result from, euryhaline fish.

QUESTION 6

Choice A is the best answer because it most accurately describes how the underlined portion functions in the text as a whole. The first two sentences of the text establish that in California, houses were heated by building fires year-round. The underlined portion then indicates that the fires didn't merely provide physical warmth: they also represented being "home" and feeling protected. The underlined portion thus illustrates that a fire provides comfort beyond physical warmth.

Choice B is incorrect because the underlined portion doesn't summarize information that came before it. Whereas the previous two sentences describe fires' ability to provide physical warmth to homes, the underlined portion focuses on the psychological comfort the fires offered. *Choice C* is incorrect. Although the text's second sentence mentions that fires were built in the summer because fog came in, which may have cooled the house, this detail isn't the focus of the underlined portion. Instead, the underlined portion indicates that fires were built for reasons beyond physical warmth: to create a sense of being home and safe. *Choice D* is incorrect because the underlined portion focuses on the emotional significance the author places on having a fire going inside the home. There is no indication that the author feels equally comfortable without a fire present.

QUESTION 7

Choice A is the best answer because it most accurately describes how the underlined phrase functions in the text as a whole. The text states that the wax produced by Liu and colleagues' reactor can be turned into a surfactant. The underlined phrase, which is set off with parentheses, then provides a definition for the term "surfactant," explaining that it's a chemical compound that can be used as a detergent. Thus, the underlined portion of the text functions to clarify the meaning of a scientific term.

Choice B is incorrect. Though the text as a whole focuses broadly on an environmental concern, the underlined phrase does not; it simply indicates what a surfactant is. *Choice C* is incorrect. Though the text as a whole focuses on a scientific discovery (Liu and colleagues' solution to the problem of plastic recycling), the underlined phrase does not explain its significance; it simply defines a scientific term used in the discussion. *Choice D* is incorrect. Though the text as a whole includes discussion of the result found by Liu and colleagues, the underlined phrase does not discuss it; it simply defines a scientific term used in the discussion. Additionally, at no point in the text is it mentioned that the team was confused.

QUESTION 8

Choice C is the best answer because it best describes the function of the underlined portion in the text as a whole. In the text, the speaker mentions the occurrence in nature of seedpods being shaken by a slight wind. The speaker then goes on to compare the black seeds to thoughts, using language that indicates that the speaker's state of mind is unsettled (e.g., "my thoughts are spent"; "My thoughts tear me, I dread their fever"). The text concludes with a comparison between the speaker's "scattered" state of mind and the "hot shrivelled seeds." Thus, the underlined portion of the text presents an observation of an occurrence in the natural world that the speaker then expands on to convey a sense of a turbulent interior state.

Choice A is incorrect because the text does not indicate that the seedpods are the cause of the speaker's state of mind; thus, they could not be responsible for any misgivings the speaker has. *Choice B* is incorrect because the text does not contrast the natural landscape with the speaker's state of mind or describe the wind shaking the seedpods as consistent; rather, the text suggests that the state of the natural world and the speaker's state of mind are similar in that both are unsettled. *Choice D* is incorrect because there is no indication in the text that the speaker regularly engages in critical self-evaluation, only that in this particular instance the speaker's state of mind is turbulent.

QUESTION 9

Choice A is the best answer because it most accurately describes how the underlined portion functions in the text as a whole. The first sentence of the text introduces literary scholar Jeremy Douglass's warning to technology investors and enthusiasts against predicting the displacement of conventional books by newer media forms. The next sentence, which is underlined in part, presents Douglass's observation that interactive texts are hardly new; they have been available for longer than technologists assume, beginning with the first time readers wrote notes in texts' margins. Thus, the function of the underlined portion is to challenge the stance of the technology investors and enthusiasts mentioned earlier in the text. As the remainder of the text points out, newer media doesn't necessarily replace older media, but rather, as Douglass believes, leads to new forms of expression.

Choice B is incorrect because the underlined portion challenges the position taken by investors and enthusiasts; it doesn't provide context for their claims. *Choice C* is incorrect because the underlined portion doesn't mention academics or compare them to investors regarding their ability to see potential in using contemporary interactive texts; instead, the underlined portion challenges the position of investors and enthusiasts who predict that conventional books will be replaced by newer forms of media. *Choice D* is incorrect because the underlined portion doesn't address technological challenges; instead, it disputes the stance taken by investors and enthusiasts, suggesting that conventional books haven't been displaced by traditional interactions with texts, such as writing in the margins, and won't be supplanted by newer forms of media either.

QUESTION 10

Choice A is the best answer because it most logically completes the text's discussion of the *M. robustus* population at the Octopus Garden. The text states that the scientists concluded that the site is likely used only for reproduction because over three years they saw many adults, freshly hatched octopuses, and eggs but didn't see any juveniles. This suggests that the *M. robustus* octopuses that hatch at the Octopus Garden leave the site when they reach an intermediary state of development, returning only as adults for reproductive purposes.

Choice B is incorrect because the text never discusses the stability of the *M. robustus* population at the site, only that the scientists observed 6,000 adults, hatchlings, and eggs there. Further, the text presents the site's temperatures as likely beneficial. *Choice C* is incorrect because the text doesn't provide any details about the eggs at the site and makes no mention of nests; it indicates only that eggs are present along with hatchlings and adults. *Choice D* is incorrect because the text makes no mention of the hatchlings feeding at the Octopus Garden, indicating only that the temperatures at the site are probably beneficial and that the site is likely used for reproduction.

QUESTION 11

Choice D is the best answer because it presents a statement about Hans Castorp's story that is suggested by the text. The narrator of the text indicates that the story about Hans Castorp will be told not because there is something particularly notable about him, since he is pleasant but "perfectly ordinary," but because the story itself is remarkable ("very much worth telling"). The narrator then notes that there is a benefit in being at the heart of the story—that it is "in Hans Castorp's favor" that the story is his, and maybe uniquely so ("not every story happens to everybody"). Thus, the text suggests both that the story that will be told is a remarkable one that happened to an unremarkable person and that it is reasonable to argue that the person at the center of a valuable story takes on some of the story's value.

Choice A is incorrect. Although the narrator of the text makes the point that "not every story happens to everybody," the narrator doesn't state that stories are interesting simply because the people they are about are unique. Rather, the narrator suggests that one particular story is "very much worth telling" on its own and that Hans Castorp benefits from the fact that the story is remarkable and may be unique to him. Further, the narrator never suggests that the story will be hard to understand even though it is old. *Choice B* is incorrect. Although the narrator of the text suggests that Hans Castorp is of no particular importance, since he is a "perfectly ordinary" person, the narrator never reveals what makes the story of Castorp important, just that "the story itself" is "very much worth telling." The narrator states that the story "took place long ago," is "covered with the patina of history," and can be told only "with verbs whose tense is that of the deepest past," but the story's age and the way it must be told aren't presented as reasons the story is important; the narrator is simply providing details about how the story will be told. *Choice C* is incorrect because the narrator of the text doesn't suggest that all stories about people who are "perfectly ordinary" (like Hans Castorp) must

be told in particular ways to make it clear why those stories are consequential. Further, the narrator suggests that Hans Castorp's story must be told "with verbs whose tense is that of the deepest past" because it took place so long ago, not because telling it that way will convey the story's importance.

QUESTION 12

Choice D is the best answer because it states the percentage of participants who mentioned costs in the interviews conducted by Judith Hilton and her team. The text states that Hilton and her team interviewed participants about factors that would encourage them to switch from single-use plastic containers to reusable containers. The graph presents three factors mentioned in the interviews (convenience, costs, and established behaviors) and the percentage of participants who mentioned each one. The graph shows that about 50% of participants mentioned costs as a factor.

Choice A is incorrect because the graph shows that about 50% of participants, not 10%, mentioned costs as a factor. *Choice B* is incorrect because the graph shows that about 50% of participants, not 95%, mentioned costs as a factor. *Choice C* is incorrect because the graph shows that about 50% of participants, not 25%, mentioned costs as a factor.

QUESTION 13

Choice A is the best answer because it presents the quotation that best supports the student's claim that in *The Politics*, Aristotle gives advice on preserving constitutions—preventing governments from falling and maintaining order—and specifically asserts that in a healthy state, laws must be followed as strictly as possible and infractions should not be overlooked even if they are minor. The philosopher states that when Aristotle builds his argument about the characteristics of a well-functioning government, Aristotle asserts that transgression, or violation of law, will ruin the state if it "creeps in unperceived," or goes unnoticed. The philosopher then adds that Aristotle illustrates this point by comparing the situation to one in which small but frequent expenses diminish a fortune almost unnoticeably until, eventually, the fortune is entirely gone. In other words, the philosopher indicates that Aristotle makes the point that total obedience to law preserves a healthy state while even small violations, if ignored, will undermine the health of the state.

Choice B is incorrect because the philosopher addresses Aristotle's observation about corruption within the government (in particular, preventing the possibility that members of the government can take bribes), and although corruption can involve infractions, the observation is about a subset of people within the state and isn't directly connected to the importance of upholding total obedience to the law throughout the state. *Choice C* is incorrect because the philosopher discusses Aristotle's point about those who would intentionally destroy a constitution altogether and the need for rulers to remind the populace that it would be dangerous for a constitution to collapse, but neither idea is directly connected to the importance of upholding total obedience to the law. *Choice D* is incorrect because the philosopher explains that Aristotle makes the point that

oligarchic leaders may retain power by having members of disenfranchised classes participate in government alongside governing classes, and this point doesn't address the importance of ensuring obedience to the law and addressing even minor violations.

QUESTION 14

Choice B is the best answer because it presents a finding that, if true, would most directly support the researchers' conclusion that an observable pattern in time references in novels reflects a shift in human behavior prompted by the spread of electric lighting in the late nineteenth century. If novels published after 1880 contain significantly more references to activities occurring after 10 p.m. than novels from earlier periods do, this would suggest a change in human behavior and daily routines enabled by the availability of electric lighting. Before electric lighting—which provided illumination more easily than other available forms of light—many activities ceased after nightfall, so references to late-night activities would be less common in earlier novels. An increase in such references after 1880 would align with the researchers' conclusion, reflecting an increase in late-night activities made possible by electric lighting.

Choice A is incorrect because a decrease in references to 10 a.m. after the year 1800 would not support the researchers' conclusion involving a shift in human behavior prompted by the spread of electric lighting toward the end of the 1800s. The time of 10 a.m. is in the morning and, in most places, characterized by daylight, so a change in references to that time would not be clearly linked to the impact of electric lighting. *Choice C* is incorrect because while an increase in implied time references relative to clock phrases in nineteenth-century novels could suggest a change in writing style or conventions, it does not directly support the conclusion involving a shift in human behavior prompted by the spread of electric lighting. The text indicates that the researchers' conclusion is based on the content of the time references themselves, not the phrasing used. *Choice D* is incorrect. If references to noon and midnight are used with roughly the same frequency in all the novels analyzed by the researchers, this would reflect a lack of change in human behavior with regard to time and therefore would not support the researchers' conclusion involving a shift in human behavior that occurred in response to the spread of electric lighting.

QUESTION 15

Choice A is the best answer because it most effectively uses data from the graph to complete the statement about Mahtta et al.'s proposal regarding factors that affect urban land expansion (ULE). According to the text, ULE is influenced by urban population growth and by gross domestic product (GDP) growth per capita. Reasoning that efficient national governments provide urban services and infrastructure needed to attract economic investment, Mahtta et al. suggest that, as governments become more efficient at providing urban services and infrastructure, GDP growth per capita will account for more ULE and urban population growth will account for less. But according to the graph, Region 1 saw an increase in the percentage attributed to urban population growth from 1970–2000 (between 60 and 65%) to 2000–2014 (between 70 and 75%) and a decrease

in the percentage attributed to GDP growth per capita from 1970–2000 (between 35 and 40%) to 2000–2014 (about 25%). Because the percentage attributed to GDP growth per capita decreased (the opposite of what Mahtta et al. claimed would happen if the governments had become more efficient), the data suggest that the governments of Region 1 became less efficient at providing urban services and infrastructure over that period.

Choice B is incorrect. Neither the graph nor the text gives the regions' relative levels of economic growth or what effect Mahtta et al. would expect such growth to have. Furthermore, Mahtta et al.'s proposal suggests that Region 1's decline in the percentage of ULE attributed to GDP growth per capita from 1970–2000 (between 35 and 40%) to 2000–2014 (about 25%) would suggest decreasing, not increasing, government efficiency over this time. *Choice C* is incorrect. Neither the text nor the graph provides information about the relative efficiencies of different governments in Region 2. *Choice D* is incorrect. Mahtta et al.'s proposal suggests that more efficient governments will have a higher percentage of their ULE driven by GDP growth per capita and a lower percentage driven by urban population growth. For Region 2, the percentage of ULE attributed to GDP growth per capita increased from 1970–2000 (between 10 and 15%) to 2000–2014 (between 45 and 50%), but the opposite is true for Region 1, which saw the percentage of ULE attributed to GDP growth per capita decline over the same period. Thus, whereas the data suggest governments in Region 2 became more efficient, the data for Region 1 suggest that those governments became less efficient, not more.

QUESTION 16

Choice B is the best answer because it describes data from the graph that best support the student's assertion that initial efforts at trade liberalization in China were shaped by firms having limited capital (assets available for use) and that this situation resolved during the 2000s. The text explains that an approach to trade liberalization involves engaging in processing imports, one type of which doesn't require payment to a trade partner (processing with assembly) and one type of which requires upfront payment to a trade partner for raw materials (processing with inputs). The graph, which presents China's imports for ordinary imports and both types of processing imports in the years 2000, 2003, and 2006, shows that while processing imports with assembly rose from about 250 hundred million dollars in 2000 to about 750 hundred million dollars in 2006, processing imports with inputs rose much more sharply, increasing from approximately 650 hundred million dollars in 2000 to about 2,300 hundred million dollars in 2006. Because processing with inputs requires firms to pay for materials (expending capital) and processing with assembly doesn't, the sharper rise in processing imports with inputs suggests that Chinese firms' assets—and thus their ability to engage in that type of processing imports—were relatively limited in (and before) 2000 and then substantially increased from 2000 to 2006. In other words, the data suggest that the situation of having limited capital resolved during the 2000s.

Choice A is incorrect because the graph indicates that ordinary imports were greater than both types of processing imports in 2006, not that processing imports with inputs were greater than ordinary imports and processing imports

with assembly that year. *Choice C* is incorrect because the observation that ordinary imports were greater than both types of processing imports in 2000, 2003, and 2006 doesn't address a change within any type of imports from 2000 to 2006, and an indication of a change in that period that might be related to the availability of assets is needed to support the assertion that the situation of having limited capital resolved during the 2000s. *Choice D* is incorrect because the fact that processing imports with assembly were greater at the end of the period from 2000 to 2006 than processing imports with inputs were at the start of the same period doesn't address a change within either type of imports during the period, and an indication of such a change that might be related to the availability of assets is needed to support the assertion that the situation of having limited capital resolved during the 2000s.

QUESTION 17

Choice C is the best answer because it most logically completes the text's discussion of Kristin Laidre's reasoning about the purpose of the tusk that many, but not all, narwhals have. The text explains that one group of scientists thinks the tusk may help narwhals detect the threat of freezing water and that Laidre disagrees with that idea, given the importance of avoiding a dangerous situation. It's logical to suggest that if the tusk serves such an important purpose for narwhals, the trait would be more common among them—specifically, that more narwhals would have a tusk.

Choice A is incorrect because there's no reason to think Laidre would say that if the tusk has the important function of helping narwhals detect when the water around them is about to freeze (meaning that it isn't always freezing), some narwhals would choose a different habitat altogether. Indeed, if it's true that the tusk helps narwhals avoid areas with dangerous conditions when they occur in their Arctic Ocean habitat, the tusk would likely enable the narwhals to continue living in that habitat rather than drive them elsewhere entirely. *Choice B* is incorrect because the text focuses only on narwhals and makes no mention of other marine animals or how having a tusk might affect them. And if anything, it would be more logical to expect a very important trait to be more widespread, not less common, among other similar types of animals. *Choice D* is incorrect. Although the text describes narwhals as shy, it doesn't indicate that the scientists' conclusion has anything to do with shyness. And because shyness and detection of the threat of freezing water aren't logically connected, there's no reason to think that Laidre would expect narwhals to become less shy over time if the tusk serves that important purpose.

QUESTION 18

Choice D is the best answer because it most logically completes the text's discussion of silicon carbide (SiC) fibers and creep, or deformation related to ongoing mechanical stress and elevated temperatures. The text states that Bhatt et al. found that a nitrogen-treated SiC fiber had a lower minimum creep rate than two polymer-derived SiC fibers did. Because having a lower creep rate means that the material is slower to deform with exposure to stress, as the text explains, this finding suggests that aerospace composites made with the nitrogen-treated SiC

fiber may be able to withstand mechanical stress for a longer period than those made with the other two polymer-derived SiC fibers can.

Choice A is incorrect because it overstates the implications of the study's findings, which have to do with the rate of a material's deformation under stress, not the absolute degree of deformation. The text states that Bhatt et al. observed that a nitrogen-treated SiC fiber had a lower minimum creep rate than two polymer-derived SiC fibers did, meaning only that it deformed more slowly over time under constant stress, not that it underwent less deformation overall. *Choice B* is incorrect because the text doesn't establish any similarity between the two polymer-derived SiC fibers other than that both had a higher creep rate than the nitrogen-treated SiC fiber did in Bhatt et al.'s study. Moreover, reducing a material's resistance to creep would mean that the material becomes more susceptible to deformation with exposure to stress and elevated temperatures, which would be expected to shorten rather than prolong the lifespan of machinery made with that material. *Choice C* is incorrect because the text suggests that the stability of aerospace equipment may be better improved by composites containing nitrogen-treated SiC fiber than by composites containing the two polymer-derived SiC fibers, not the other way around. The text indicates that Bhatt et al. observed that the nitrogen-treated SiC fiber had a lower minimum creep rate than the other two fibers did, meaning that it was slower to degrade under exposure to mechanical stress and elevated temperatures—suggesting that it may remain stable for longer periods.

QUESTION 19

Choice A is the best answer. The convention being tested is the use of verb forms within a sentence. The singular verb "describes" agrees in number with the singular subject "map."

Choice B is incorrect because the plural verb "describe" doesn't agree in number with the singular subject "map." *Choice C* is incorrect because the plural verb "have described" doesn't agree in number with the singular subject "map." *Choice D* is incorrect because the plural verb "are describing" doesn't agree in number with the singular subject "map."

QUESTION 20

Choice D is the best answer. The convention being tested is the use of determiners in a sentence. The plural determiner "these" agrees in number with the plural noun "letters" that it modifies. This choice clearly indicates that the letters demonstrate Alcott's business sense.

Choice A is incorrect because the singular determiner "one" doesn't agree in number with the plural noun "letters." *Choice B* is incorrect because the singular determiner "that" doesn't agree in number with the plural noun "letters." *Choice C* is incorrect because the singular determiner "this" doesn't agree in number with the plural noun "letters."

QUESTION 21

Choice D is the best answer. The convention being tested is the use of verbs to express tense in a sentence. In this choice, the past tense verb "affected," used in conjunction with the phrase "during this time," correctly indicates that the dust storms occurred in the 1930s.

Choice A is incorrect because the present progressive tense verb "are affecting" doesn't indicate that the dust storms occurred in the 1930s. *Choice B* is incorrect because the future perfect tense verb "will have affected" doesn't indicate that the dust storms occurred in the 1930s. *Choice C* is incorrect because the future tense verb "will affect" doesn't indicate that the dust storms occurred in the 1930s.

QUESTION 22

Choice C is the best answer. The convention being tested is the coordination of main clauses within a sentence. This choice correctly uses a comma and a coordinating conjunction ("but") to join the first main clause ("Leibniz...century") and the second main clause ("these ingenious...calculators").

Choice A is incorrect because it results in a run-on sentence. The two main clauses are fused without punctuation and/or a conjunction. *Choice B* is incorrect because it results in a comma splice. Without a conjunction following it, a comma can't be used in this way to join two main clauses. *Choice D* is incorrect because joining the two main clauses in this way with the subordinating conjunction "that" results in an ungrammatical and illogical sentence.

QUESTION 23

Choice C is the best answer. The convention being tested is the use of verb forms within a sentence. The nonfinite past participle "characterized" is correctly used within a supplementary element that modifies the main clause "Zhang...*shanshui*," defining *qinglü shanshui* and explaining some of its identifying traits.

Choice A is incorrect because it results in a comma splice. Using the finite present perfect tense verb "has been characterized" creates a second main clause in the sentence, and the two main clauses can't be joined in this way by only the comma before "a type." *Choice B* is incorrect because it results in a comma splice. Using the finite future tense verb "will be characterized" creates a second main clause in the sentence, and the two main clauses can't be joined in this way by only the comma before "a type." *Choice D* is incorrect because it results in a comma splice. Using the finite present tense verb "is characterized" creates a second main clause in the sentence, and the two main clauses can't be joined in this way by only the comma before "a type."

QUESTION 24

Choice A is the best answer. The convention being tested is punctuation use between sentences. In this choice, the period is used correctly to mark the boundary between one sentence ("What…vapor") and another ("With…point").

Choice B is incorrect because it results in a run-on sentence. The sentences ("What…vapor" and "with…point") are fused without punctuation and/or a conjunction. *Choice C* is incorrect because it results in a comma splice. A comma can't be used in this way to mark the boundary between sentences. *Choice D* is incorrect. Without a comma preceding it, the conjunction "and" can't be used in this way to join sentences.

QUESTION 25

Choice D is the best answer. The convention being tested is subject-modifier placement. This choice makes the noun phrase "the Alaska Centennial Commission" the subject of the sentence and places it immediately after the modifying phrase "wanting…Purchase." In doing so, this choice clearly establishes that the Alaska Centennial Commission—and not another noun in the sentence—wanted to celebrate the 100th anniversary of the Alaska Purchase.

Choice A is incorrect because it results in a dangling modifier. The placement of the noun phrase "a contest" immediately after the modifying phrase illogically suggests that the contest wanted to celebrate the 100th anniversary of the Alaska Purchase. *Choice B* is incorrect because it results in a dangling modifier. The placement of the noun phrase "an award of $300" immediately after the modifying phrase illogically suggests that the award of $300 wanted to celebrate the 100th anniversary of the Alaska Purchase. *Choice C* is incorrect because it results in a dangling modifier. The placement of the noun phrase "$300" immediately after the modifying phrase illogically suggests that the $300 wanted to celebrate the 100th anniversary of the Alaska Purchase.

QUESTION 26

Choice D is the best answer. The convention being tested is the use of punctuation within a sentence. This choice correctly uses a comma to mark the boundary between the main clause ("Recently...supposed") and the supplementary element ("a finding...Paleolithic") that provides additional information about the implications of the Neronian tool discovery.

Choice A is incorrect because a semicolon can't be used in this way to join the main clause ("Recently...supposed") and the supplementary element ("a finding... Paleolithic"). *Choice B* is incorrect because it results in a rhetorically unacceptable sentence fragment beginning with "a finding." *Choice C* is incorrect because it results in a run-on sentence. The main clause ("Recently...supposed") and the supplementary element ("a finding...Paleolithic") are fused without punctuation and/or a conjunction.

QUESTION 27

Choice A is the best answer. "Additionally" logically signals that guard cells' role in regulating water loss is an additional function of these specialized plant cells that is separate from the function of regulating carbon dioxide intake.

Choice B is incorrect because "previously" illogically signals that the activity described in this sentence occurs earlier in a chronological sequence of events

than the regulation of carbon dioxide intake described in the previous sentence. Instead, regulating water loss is an additional function of guard cells that is separate from the function of regulating carbon dioxide intake. *Choice C* is incorrect because "in conclusion" illogically signals that the description of guard cells' role in regulating water loss concludes or summarizes the information about guard cells provided in the previous sentences. Instead, regulating water loss is one of the two distinct functions of guard cells described in the text. *Choice D* is incorrect because "instead" illogically signals that the activity described in this sentence happens in place of the activity of regulating carbon dioxide intake described in the previous sentence. Rather, regulating water loss is an additional function of guard cells.

QUESTION 28

Choice D is the best answer. The sentence identifies the type of scientist Chaudhuri is, noting that she is a sedimentologist.

Choice A is incorrect. The sentence provides an example of a type of sedimentary rock; it doesn't identify what type of scientist Chaudhuri is. *Choice B* is incorrect. The sentence indicates types of rock that some scientists study; it doesn't identify what type of scientist Chaudhuri is. *Choice C* is incorrect. While the sentence states that some scientists study sedimentary rocks, it doesn't identify Chaudhuri as this type of scientist.

QUESTION 29

Choice A is the best answer. The sentence indicates where "Raymond's Run" takes place, stating that it takes place in Harlem.

Choice B is incorrect. The sentence identifies the book in which the story "Raymond's Run" was published; it doesn't indicate where the story takes place. *Choice C* is incorrect. The sentence indicates the point of view used in "Raymond's Run"; it doesn't indicate where the story takes place. *Choice D* is incorrect. The sentence identifies the author of "Raymond's Run"; it doesn't indicate where the story takes place.

QUESTION 30

Choice C is the best answer. The sentence contrasts the two styles of tiles, noting that tiles in the arista style have designs stamped into them, whereas tiles in the majolica style have designs painted directly on them.

Choice A is incorrect because the sentence indicates that the two styles of tile can be found in the same location; it doesn't contrast the two styles of tile. *Choice B* is incorrect because the sentence indicates that the Royal Alcázar of Seville features tiles in both the majolica and arista styles; it doesn't contrast the two styles of tile. *Choice D* is incorrect because the sentence indicates that the tilework of the Royal Alcázar of Seville includes tiles in the majolica style; it doesn't contrast tiles in the majolica style with tiles in the arista style.

QUESTION 31

Choice B is the best answer. The sentence contrasts the two songs, noting that "Poor Miner's Farewell" is about coal miners in Kentucky, whereas "Bring Him Back Home" is about Nelson Mandela.

Choice A is incorrect. The sentence emphasizes a similarity between "Poor Miner's Farewell" and "Bring Him Back Home"; it doesn't contrast the two songs. *Choice C* is incorrect. While the sentence provides a description of the song "Bring Him Back Home," it doesn't mention "Poor Miner's Farewell" or contrast the two songs. *Choice D* is incorrect. While the sentence provides a description of the song "Poor Miner's Farewell," it doesn't mention "Bring Him Back Home" or contrast the two songs.

QUESTION 32

Choice C is the best answer. Using a quotation from Stewart, the sentence challenges Thucydides's explanation that the rise of Athens caused the conflict, suggesting that it was instead caused by a "clash of cultures."

Choice A is incorrect. While the sentence uses a quotation, the quotation doesn't challenge Thucydides's explanation of the conflict. *Choice B* is incorrect. While the sentence mentions that Stewart challenged Thucydides's explanation of the conflict, it doesn't use a quotation to challenge Thucydides's explanation: the quoted word "inevitable" is from Thucydides. *Choice D* is incorrect. While the sentence appears to refute Thucydides's explanation, it does so in a way that misrepresents the information in the notes; Allison's Thucydides trap theory is based on Thucydides's explanation of the conflict. Thus, Allison's theory affirms, rather than challenges, Thucydides's explanation.

QUESTION 33

Choice D is the best answer. The sentence presents an overview of the study's findings, noting that, for some of the languages (the examples of Spanish and Vietnamese are given in the notes), the number of syllables spoken per second varied, while the amount of information conveyed per second remained roughly constant across all 17 languages.

Choice A is incorrect. While the sentence describes one of the metrics the study assessed, it doesn't present any of the study's findings. *Choice B* is incorrect. While the sentence compares specific findings about two of the languages studied, it doesn't provide an overview of the study's findings across all 17 languages. *Choice C* is incorrect. The sentence compares specific findings about two of the languages studied; it doesn't provide an overview of the study's findings across all 17 languages. It also misrepresents the information from the notes about Spanish's information rate.

Reading and Writing

Module 2

(33 questions)

QUESTION 1

Choice C is the best answer because it most logically completes the text's discussion of *carte de visite* photos. To "popularize" a technology is to allow it to be used and appreciated widely. The text explains that unlike the photos produced by earlier forms of photographic technology, *carte de visite* photos were inexpensive and could easily be obtained by "everyday people," who enjoyed exchanging the images. Therefore, *carte de visite* photos helped popularize photography.

Choice A is incorrect because the text indicates that instead of weakening the emerging technology of photography, *carte de visite* photos allowed it to be more widely accessed and enjoyed by people. *Choice B* is incorrect. The text establishes that large numbers of people enjoyed using *carte de visite* photos, so it can be inferred that these photos caused photography to be praised, or celebrated. However, it wouldn't make sense to say that inanimate objects—in this case, photos—had praised photography; instead, *carte de visite* consumers themselves would have praised it. *Choice D* is incorrect because the text explains that rather than isolating photography, or limiting its availability, *carte de visite* technology made photography more widely accessible to people.

QUESTION 2

Choice D is the best answer because it most logically completes the text's discussion of painter Alma W. Thomas's work. In this context, "influenced" means to have had an effect on something's development. The text indicates that there is a connection between Thomas's work and the flowers and trees in her home's garden, giving the example of Thomas's brushstrokes being inspired by light shining through the leaves of a tree in front of her house. This context conveys that Thomas's work was influenced by the flowers and trees in the garden.

Choice A is incorrect because the text conveys that Thomas drew inspiration for her work from the plants in her garden, which suggests that the flowers and trees contributed positively to her work, not that they "restricted," or limited, her work.

Choice B is incorrect because it wouldn't make sense to suggest that flowers and trees in a garden could have "announced," or made known, a painter's work. *Choice C* is incorrect because the text conveys that Thomas drew inspiration for her work from the plants in her garden, which suggests that the flowers and trees contributed positively to her work, not that they were a distraction. Further, it's not clear how an artist's work could itself be "distracted."

QUESTION 3

Choice C is the best answer because it most logically completes the text's discussion of the conservationists' efforts to increase Azores bullfinch's numbers. In this context, "successful" means accomplishing a goal or purpose. According to the text, conservationists planted more than 500,000 native trees in an Azores bullfinch habitat in order to boost the bird's population size. The text then indicates that the population size did indeed grow as a result of the planted trees. Thus, in this context, the conservationists' approach of planting native trees was successful because it achieved the goal of increasing the bird's population size.

Choice A is incorrect because the text gives no indication that the conservationists' approach of planting native trees to increase Azores bullfinch's numbers was "amusing," or comical or entertaining. Instead, the approach was seriously undertaken and ultimately accomplished. *Choice B* is incorrect because the text doesn't address how much it cost to achieve the goal of planting native trees to increase Azores bullfinch's numbers. The text indicates that the approach was beneficial and successful rather than "costly," or expensive or harmful. *Choice D* is incorrect. According to the text, the conservationists' approach of planting native trees to increase Azores bullfinch's numbers was beneficial and successful rather than "disastrous," or damaging or unsuccessful.

QUESTION 4

Choice D is the best answer because it most logically completes the text's discussion of the duration of gamma ray burst GRB 230307A. In this context, "an oddity" is something that is odd or unusual. The text explains that the burst lasted for 200 seconds and that other bursts generated by neutron mergers have usually lasted fewer than 2 seconds. In other words, the duration of gamma ray burst GRB 230307A was unusual.

Choice A is incorrect because the text focuses on a difference between the duration of gamma ray burst GRB 230307A and the typical duration of bursts caused by neutron mergers, not "a coincidence," or a point of correspondence, between them; the text indicates that GRB 230307A lasted much longer than what is typical of other bursts. *Choice B* is incorrect. In this context, "a reprieve" would be either a temporary relief from something or a delay of a punishment, neither of which would make sense as something that the duration of a gamma ray burst could provide to the burst itself. *Choice C* is incorrect. Although it would make sense to refer to gamma ray burst GRB 230307A itself as "an incident," or a thing that occurred, the missing word describes the duration of the burst, and it doesn't make much sense to describe a length of time as an incident. Further, the sentence emphasizes that the burst's duration was very unusual, not simply that the burst occurred.

QUESTION 5

Choice B is the best answer because it most logically completes the text's discussion of Benjamin Franklin's popularity in France. In this context, "esteem" means high regard. The text indicates that Franklin was very popular, or highly regarded, in France, where he sought the country's support for the United States in its fight for independence, and indicates that his status helped him achieve his goal. The context therefore suggests that being held in high regard by the people likely helped Franklin convince France to help the United States.

Choice A is incorrect because the text directly indicates that it was Franklin's popularity that likely helped him convince France to help the United States, not his "thoughtfulness" (which in this context would mean either his careful reasoning and attention or his kind consideration of others' needs). *Choice C* is incorrect because the text doesn't suggest that there was any "controversy," or dispute, about Franklin's presence in France; instead, the text states that Franklin was very popular in France and directly indicates that this status likely helped him convince France to help the United States. *Choice D* is incorrect because the text directly indicates that it was Franklin's popularity that likely helped him convince France to help the United States, not his "sincerity," or his honesty.

QUESTION 6

Choice A is the best answer because it most accurately describes how the underlined sentence functions in the text as a whole. The first sentence of the text establishes that scientists didn't know much about the ocean floor in the 1950s. The second sentence, which is underlined, describes what many scientists thought at the time—that the ocean floor was mostly flat. The remainder of the text establishes that the ocean floor is far from flat, citing research conducted by Marie Tharp and Bruce Heezen. Thus, the purpose of the underlined sentence is to identify a scientific belief that Tharp and Heezen showed to be wrong.

Choice B is incorrect. Although Tharp and Heezen's work with sonar data in the Atlantic Ocean is mentioned later in the text, the underlined sentence doesn't describe the design of their experiment. Instead, it identifies a belief held by scientists that Tharp and Heezen demonstrated to be wrong. *Choice C* is incorrect because the underlined sentence presents a belief held by many scientists in the 1950s; nowhere does the text mention a disagreement between Tharp and Heezen, whom the text describes as research partners working together to map the ocean floor. *Choice D* is incorrect because the underlined sentence doesn't present data in support of a claim; instead, it presents a scientific belief that Tharp and Heezen's work showed to be wrong.

QUESTION 7

Choice B is the best answer because it accurately describes the function of the underlined phrase in the text as a whole. According to the text, advertisers were reluctant to support television in its early days. The underlined phrase then indicates that this reluctance was partly due to the US's involvement in World War II, which hindered television production. Thus, the underlined phrase identifies a specific reason behind some advertisers' hesitance to support television.

Choice A is incorrect. The text merely mentions that television was expected to be financed through advertising, as radio was at the time. Nothing in the text compares the origins of radio and television. *Choice C* is incorrect. The underlined phrase focuses on a reason advertisers were reluctant to support television, not measures taken to convince advertisers to support television. *Choice D* is incorrect. The underlined phrase focuses on a reason advertisers were reluctant to support television, not what types of television programming were popular.

QUESTION 8

Choice B is the best answer because it most accurately describes the function of the underlined sentence in the text as a whole. The text discusses the Bayeux Tapestry, making the point that the workers who produced the huge tapestry in the eleventh century might not have ever produced a tapestry so large before. The text goes on to suggest that because of this lack of previous experience, the workers developed and refined the process of joining the tapestry's panels over time as they worked. The last sentence of the text then provides an example of an observation that suggests the workers' process changed: clear misalignment of the borders of the two panels the workers joined first and virtually invisible joins completed later. Thus, the underlined sentence serves to support an argument about the workers who produced the tapestry.

Choice A is incorrect because the example given in the last sentence of the text has to do with how the panels of the Bayeux Tapestry were joined by the workers, not with what is depicted in those panels; the text never identifies any people or places depicted in the tapestry. *Choice C* is incorrect because the last sentence compares how early panels in the Bayeux Tapestry were joined with how later panels in the same tapestry were joined; it doesn't make any comparison between the Bayeux Tapestry and other tapestries from the same time in France. *Choice D* is incorrect because the last sentence doesn't address the location where the Bayeux Tapestry was created; the first sentence of the text presents it as a given that the tapestry was created in France, but nothing in the text indicates how that origin was determined.

QUESTION 9

Choice D is the best answer because it reflects how the author of Text 2 would most likely respond to what the researchers mentioned in Text 1 contend. Text 1 discusses the lack of knowledge of how plate tectonics on Earth began. Text 1 also mentions researchers who contend that movements of tectonic plates began around 3 billion years ago. As support for this assertion, these researchers cite computer models (which are simulations, not empirical evidence) of the temperature in Earth's mantle that show that at that time, the mantle would have been sufficiently molten for plates to move. However, the author of Text 2 asserts that empirical evidence from the geological record is necessary to make plausible claims about when tectonic movement began. Text 2 mentions an analysis performed by Wriju Chowdhury and his team of the geochemistry of zircon crystals (which would constitute empirical evidence). Chowdhury and his team argue, based on this analysis, that tectonic plates may have begun to move as early as 4.2 billion years ago. Therefore, since the author of Text 2 would consider

Chowdhury et al.'s empirical evidence to be more conclusive than the computer models cited in Text 1, the author of Text 2 would most likely assert that a more definitive form of evidence than the computer models suggests a different timeline for the onset of plate tectonics on Earth.

Choice A is incorrect because the author of Text 2 makes no claims about the temperature of Earth's mantle and therefore wouldn't argue that the temperature of Earth's mantle 3 billion years ago was insufficient to allow tectonic movement. *Choice B* is incorrect because the author of Text 2 claims that empirical evidence is needed to fix the earliest date of tectonic movement. Computer models are simulations, not empirical evidence, so the author of Text 2 wouldn't distinguish between different kinds of computer models but would instead argue that no computer models can reliably predict the onset of plate tectonics. *Choice C* is incorrect because the author of Text 2 wouldn't consider any computer model to be able to provide evidence to support a plausible claim about tectonic movement, no matter how much such models were improved. The author of Text 2 would only accept empirical evidence.

QUESTION 10

Choice B is the best answer because it most accurately states what feature of *Hevea brasiliensis* is helpful for the process of making rubber. According to the text, this tree species produces latex, which is used to make rubber, and its inner bark contains a "network of tubes" that, when cut, enables the latex to flow out. The text explicitly states that this feature of *Hevea brasiliensis* is "helpful for the process of making rubber."

Choice A is incorrect because the text doesn't mention the quality of the rubber produced from the latex of *Hevea brasiliensis* or compare its quality to that of rubber produced from other sources. *Choice C* is incorrect because the text never discusses the climates in which *Hevea brasiliensis* grows. Moreover, the text mentions only one region where this tree is found: the Amazon rainforest. *Choice D* is incorrect. Because the text states that *Hevea brasiliensis* is the world's "main source of natural rubber," it can be inferred that there is at least one other source. However, the text doesn't specify whether that other source is also a tree species and, if so, whether that species grows in the Amazon rainforest.

QUESTION 11

Choice B is the best answer because it best states the main idea of the text: that nature-based approaches can be effective for achieving conservation goals. The text indicates that in many cases where conservationists are trying to protect ecosystems, their methods depend on natural processes or features. The text then gives an example of this phenomenon, a project with the Quinault Indian Nation that allowed logjams to form naturally in a river, creating spawning habitats for blueback salmon.

Choice A is incorrect. Although the text does suggest that the partnership with the Quinault Indian Nation was beneficial, this is not the central aim of the text; the text primarily argues that nature-based approaches to conservation can be effective. *Choice C* is incorrect. Although the text indicates that logjams are

helpful to blueback salmon, the example of the blueback salmon project is included to illustrate the larger point made earlier in the text: that nature-based approaches to conservation are often effective. *Choice D* is incorrect. There is no evidence in the text to support a direct comparison of the efficacy of nature-based conservation approaches to other types of approaches. The text merely indicates that nature-based approaches can often be effective.

QUESTION 12

Choice D is the best answer because it effectively uses data from the table to complete the student's claim about the highest percentage of bus stops with shaded shelter in the areas represented. The table shows the highest average surface temperature of five areas and the percentage of bus stops with shaded shelter in each area, and 29% is the highest percentage listed.

Choice A is incorrect because the list of percentages of bus stops with shaded shelter does not include 50%; the highest percentage in the table is 29%. *Choice B* is incorrect because 15% is the lowest value in the listed percentages of bus stops with shaded shelter, not the highest value. *Choice C* is incorrect because the list of percentages of bus stops with shaded shelter does not include 90%; the highest percentage in the table is 29%.

QUESTION 13

Choice C is the best answer because it states the total area of Bahrain that is indicated in the table. The table presents the total area (in square miles) and population for Bahrain, Qatar, and Kuwait, and it indicates that the total area of Bahrain is 304 square miles.

Choice A is incorrect because the table indicates that 4,268,873 is the population of Kuwait, not the total area of Bahrain. *Choice B* is incorrect because the table indicates that 4,471 square miles is the total area of Qatar, not of Bahrain. *Choice D* is incorrect because the table indicates that 6,880 square miles is the total area of Kuwait, not of Bahrain.

QUESTION 14

Choice C is the best answer because it presents the quotation that most effectively illustrates the claim that Echelman's sculptures appear delicate but are in fact quite durable. The text explains that Echelman's sculptures include flowing shapes that mimic the wind. If it is true that the materials she uses are both flexible and strong, that would help explain why the works are durable even though they appear delicate.

Choice A is incorrect because the claim in the text is not about how Echelman models her work before sculpting. *Choice B* is incorrect because the claim in the text is not about the planning and design phases of Echelman's work. *Choice D* is incorrect because the claim in the text is not about how the sculptures relate to their locations.

QUESTION 15

Choice D is the best answer because it presents a finding that, if true, would most directly support the researchers' conclusion that the transition from a stagnant lid regime to a tectonic plate regime occurred around 3.2 billion years ago. The text explains that early in Earth's history, Earth exhibited a stagnant lid regime in which there's no interaction between the lithosphere and the underlying mantle. The text further explains that, by contrast, once Earth began to exhibit a tectonic plate regime, its lithospheric and mantle material began to mix. If mantle-derived rocks younger than 3.2 billion years contain material not found in older mantle-derived rocks, that material must have originated somewhere other than the mantle. And if this material is found in both older and contemporaneous lithospheric rocks, that would imply that the lithosphere was able to mix with mantle material beginning around 3.2 billion years ago, as the researchers concluded.

Choice A is incorrect. The text gives no basis for comparing the quantities of lithospheric and mantle-derived rocks. *Choice B* is incorrect. The text gives no basis for comparing the material makeup of lithospheric rocks to that of mantle-derived rocks. *Choice C* is incorrect. A positive correlation between the age of lithospheric rocks and these rocks' chemical similarity to mantle-derived rocks would mean that the oldest rocks would be the most similar, which contradicts the text's claim that lithospheric and mantle-derived rocks were completely separate until 3.2 billion years ago. If the researchers' conclusion about the onset of tectonics on Earth is correct, then younger lithospheric rocks would show greater chemical similarity to mantle-derived rocks than older lithospheric rocks do.

QUESTION 16

Choice D is the best answer because it most logically completes the discussion of Uto-Aztecan languages. The text explains that the northern and southern branches of the Uto-Aztecan language family descended from a single language (believed to have originated in what is now the US Southwest), resulting in similarities across the family's languages; however, the branches don't have similar vocabulary for maize, even though maize has been cultivated by all Uto-Aztecan tribes. The text also indicates that maize originated in Mexico and spread northward into what is now the US Southwest—the area where the Uto-Aztecan language family originated. It follows, then, that the language family had already divided into northern and southern branches before maize reached that area; if maize had been present before the division occurred, the family's origin language would have had terminology for it that likely would have been reflected in the branches, meaning they would have had similar vocabulary for maize. If maize arrived after the division occurred, however, the tribes in the two regions likely would have developed vocabulary pertaining to maize separately, at the times when they acquired the crop.

Choice A is incorrect because the text focuses on vocabulary pertaining to maize in the branches of the Uto-Aztecan language family, and referring only to how some Uto-Aztecan tribes obtained maize wouldn't directly address the role of language. Moreover, if northern Uto-Aztecan tribes had acquired maize from a southern Uto-Aztecan tribe, it's reasonable to assume that the northern tribes

might have also picked up southern Uto-Aztecan terminology for maize in that exchange. *Choice B* is incorrect because the text discusses the fact that the northern and southern branches of the Uto-Aztecan language family don't have shared vocabulary pertaining to maize, not the idea that there are variations in such vocabulary within each branch—that is, the text focuses on differences between the two branches, not on differences between languages within a branch. *Choice C* is incorrect because the text focuses on vocabulary pertaining to maize in the branches of the Uto-Aztecan language family, and referring only to the timing and source of maize acquisition wouldn't directly address the role of language. Furthermore, the text implies that southern Uto-Aztecan tribes probably acquired maize before the northern tribes did, given the evidence that maize originated in Mexico—the location of the best-known representative of the southern branch of the Uto-Aztecan language family—before spreading to the north.

QUESTION 17

Choice B is the best answer because it most logically completes the text's discussion of the sediments found at the Gale Crater's Murray Formation on Mars. The text states that data gathered by the *Curiosity* rover suggest that bodies of water deposited sediment on Mars's surface long ago. The text goes on to say that studying the sediment, Rivera-Hernández et al. found some coarse grains they believe are sandstone, which tends to be left by flowing water, and many more fine grains they believe are mudstone, which tends to slowly sink in low-flow water. The text further indicates that the researchers noted cracks in the fine grains that suggest there were cycles of desiccation, or drying, at the site. Taken together, this information suggests that a lake (a body of low-flow water) existed at the site for a prolonged period but occasionally experienced drying and that there were periods in which one or more streams (flowing water) were present, since the extended existence of a lake would account for the abundance of fine grains, periods of drying would account for the cracks in the fine grains, and periods with streams would account for the sections of coarse grains.

Choice A is incorrect because the text indicates that an abundance of fine grains of sediment was found at the Murray Formation site, which suggests that a low-flow water source (such as a lake) was present. Further, the text makes no mention of where the water at the site may have originated from. *Choice C* is incorrect because the evidence described in the text doesn't support the idea that there were streams at the Murray Formation for an extended period and a lake for just a short time. The abundance of fine grains suggests that a lake (a body of low-flow water) was present for an extended time, not just a short time, and the sections of coarse grains suggest that one or more streams (bodies of flowing water) were intermittently present while the lake existed, not at a separate time. *Choice D* is incorrect. Although the text suggests that both a low-flow body of water (such as a lake) and flowing water (such as streams) existed at the Murray Formation site, meaning that there could have been a stream-fed lake, the text explains that the fine grains that signify the presence of a lake exhibit cracking that indicates periods of desiccation, or drying, which suggests that a lake was present but did occasionally dry out.

QUESTION 18

Choice B is the best answer because it most logically completes the text's discussion of Sidonian coins. As the text explains, researchers determined that Sidonian coins were made of silver and copper and that from 450 BCE to 367 BCE, the percentage of silver in each coin decreased from 98% to 74.2% while the percentage of copper increased from 1% to 24.7%. The text indicates that because the coins containing less than 80% silver weren't considered suitable for trade (suggesting that copper was less valuable than silver) and looked different from coins containing more silver, the researchers suspect there was a serious loss in confidence in the currency in Sidon in 367 BCE when the copper content was high. It's reasonable to assume that it wasn't possible to boost confidence simply by devoting a greater amount of valuable silver to the currency, since Sidon was under significant and ongoing financial pressure; however, keeping the total amount of silver the same and reducing the amount of copper in the coins would have resulted in smaller coins with a higher percentage of silver. Therefore, it makes sense to suggest that Abd'aštart I (the ruler after 367 BCE) likely restored confidence in the currency by deciding to keep the amount of silver in Sidonian coins consistent with that in coins minted in 367 BCE but to decrease the coins' weight.

Choice A is incorrect because the text conveys that a crisis in confidence in the currency of Sidon likely occurred around 367 BCE because the percentage of silver in coins had fallen below 80% (presumably because Sidon's financial pressures meant that less silver was available for currency), making the coins unsuitable for trade. Thus, announcing that the threshold for the percentage of silver in coins would be raised—that is, that coins would need to contain even more than 80% silver to be suitable for trade—likely would have worsened the crisis rather than relieved it. *Choice C* is incorrect because the text strongly suggests that a crisis in confidence in the currency of Sidon was caused by the proportion of silver to copper in the coins in 367 BCE, with 74.2% being too little silver for the coins to be considered suitable for trade; therefore, it's unlikely that minting coins with a similar proportion of silver to copper (that is, still around 74.2% silver) would have restored confidence, even if the coins were heavier. *Choice D* is incorrect because the text gives no indication that funding the mining of more copper would have relieved a crisis in confidence in the currency of Sidon. The text establishes that Sidonian coins that visibly contained copper weren't considered suitable for trade, so Abd'aštart I wouldn't have wanted to add even more copper to them, and it's unclear how else copper mining would affect views of the currency.

QUESTION 19

Choice D is the best answer. The convention being tested is the use of verb forms within a sentence. The nonfinite to-infinitive verb "to include" is correctly used to form a subordinate clause that indicates what the Olympic committee decided (to include tug-of-war as an Olympic event).

Choice A is incorrect because it results in an ungrammatical sentence. The finite verb "included" can't be used in this way to form a subordinate clause that

indicates what the Olympic committee decided. *Choice B* is incorrect because it results in an ungrammatical sentence. The nonfinite participle "including" can't be used in this way to form a subordinate clause that indicates what the Olympic committee decided. *Choice C* is incorrect because it results in an ungrammatical sentence. The finite verb "include" can't be used in this way to form a subordinate clause that indicates what the Olympic committee decided.

QUESTION 20

Choice D is the best answer. The convention being tested is the use of verbs to express tense. In this choice, the past tense verb "malfunctioned" is consistent with the other past tense verbs ("ignited" and "was") used to describe the destruction of the original Globe Theatre.

Choice A is incorrect because the present tense verb "malfunctions" isn't consistent with the other past tense verbs used to describe the destruction of the original Globe Theatre. *Choice B* is incorrect because the future tense verb "will malfunction" isn't consistent with the other past tense verbs used to describe the destruction of the original Globe Theatre. *Choice C* is incorrect because the present perfect tense verb "has malfunctioned" isn't consistent with the other past tense verbs used to describe the destruction of the original Globe Theatre.

QUESTION 21

Choice C is the best answer. The convention being tested is punctuation use between a subject and a verb. No punctuation is needed when, as in this case, a subject ("Her portrait of novelist Zadie Smith") is immediately followed by a main verb ("is displayed").

Choice A is incorrect because no punctuation is needed between the subject and the verb. *Choice B* is incorrect because no punctuation is needed between the subject and the verb. *Choice D* is incorrect because no punctuation is needed between the subject and the verb.

QUESTION 22

Choice C is the best answer. The convention being tested is pronoun-antecedent agreement. The singular pronoun "it" agrees in number with the singular antecedent "industry" and clearly indicates that the industry consists of just one or two suppliers per municipality.

Choice A is incorrect. The plural pronoun "these" neither agrees in number with the singular antecedent "industry" nor clearly indicates that the industry—not another plural noun in the sentence, such as "start-up costs" or "barriers"—consists of just one or two suppliers per municipality. *Choice B* is incorrect because the plural pronoun "they" doesn't agree in number with the singular antecedent "industry." *Choice D* is incorrect because the singular pronoun "this" is ambiguous in this context; the resulting sentence leaves unclear what consists of just one or two suppliers per municipality.

QUESTION 23

Choice C is the best answer. The convention being tested is the punctuation of elements in a complex series. It's conventional to use a semicolon to separate items in a complex series with internal punctuation, and in this choice, the semicolon after "items" is conventionally used to separate the first item ("overseeing…items") and the second item ("managing…law") in a list of Hayden's responsibilities.

Choice A is incorrect because it fails to use appropriate punctuation to separate the first item and the second item in the complex series. *Choice B* is incorrect because a comma after "items" doesn't match the semicolon used later to separate the second and third items in the series ("managing…law" and "and appointing the US poet laureate"). *Choice D* is incorrect because it results in a rhetorically unacceptable sentence fragment beginning with "Managing."

QUESTION 24

Choice A is the best answer. The convention being tested is the use of punctuation within a sentence. The comma after "work" pairs with the comma after "though" to separate the supplementary element "though" from the rest of the sentence. This supplementary element signals that what follows is an exception to Chen using software tools to create illustrations, and the pair of commas indicates that this element could be removed without affecting the grammatical coherence of the sentence.

Choice B is incorrect because the comma after "work" must be paired with a comma after "though" to separate the supplementary element from the rest of the sentence. *Choice C* is incorrect because a semicolon can't be paired with a comma in this way to separate the supplementary element from the rest of the sentence. *Choice D* is incorrect because a semicolon can't be paired with a comma in this way to separate the supplementary element from the rest of the sentence.

QUESTION 25

Choice B is the best answer. The convention being tested is the use of punctuation within a sentence. This choice correctly uses a comma to separate the supplementary adverb "though" from the preceding main clause ("They are hardly pristine") and uses a semicolon to join the two main clauses ("They… though" and "many…objects"). Further, placing the semicolon after "though" indicates that the information in the preceding main clause (chondrites are far from pristine) is contrary to what might be assumed from the information in the previous sentence (chondrites have been generally unaltered by their environment).

Choice A is incorrect because placing the comma after "pristine" and using "though" as a subordinating conjunction illogically indicates that the information in the next main clause (many chondrites have experienced damage) is contrary to the information in the previous clause (chondrites are far from pristine). *Choice C* is incorrect because placing the semicolon after "pristine" illogically

indicates that the information in the next main clause (many chondrites have experienced damage) is contrary to the information in the previous clause (chondrites are far from pristine). *Choice D* is incorrect because it results in a comma splice. Without a conjunction following it, the comma after "though" can't be used in this way to join two main clauses.

QUESTION 26

Choice D is the best answer. The convention being tested is the use of punctuation within a sentence. This choice uses a semicolon in a conventional way to join the first main clause ("That the...involved") and the second main clause ("establishing...divisive"). Further, the semicolon is the most appropriate choice when joining two separate, parallel statements, such as here, where the information following the semicolon contrasts with the information before.

Choice A is incorrect because placing a colon after "involved" illogically indicates that the information in the second main clause (the precise location was the subject of disagreement) explains or amplifies the information in the previous main clause (the general location was agreed upon by all). Instead, the information in the second clause contrasts with the previous information. *Choice B* is incorrect because it results in a comma splice. Without a conjunction following it, a comma can't be used in this way to join two main clauses. *Choice C* is incorrect because it results in a run-on sentence. The two main clauses are fused without punctuation and/or a conjunction.

QUESTION 27

Choice B is the best answer. "As a result" logically signals that the action described in this sentence—closing the area around Garisenda Tower to explore stabilization solutions—occurred as a consequence or result of measurements revealing the tower's concerning rotation.

Choice A is incorrect because "similarly" illogically signals that the action of closing the tower area is similar to the discovery of concerning rotation described in the previous sentence. Instead, closing the area around the tower to explore solutions occurred as a result of the measurements revealing the rotation. *Choice C* is incorrect because "for example" illogically signals that the action of closing the tower area serves as an example of the tower's concerning rotation described in the previous sentence. Instead, closing the area around the tower to explore solutions occurred as a result of the measurements revealing the rotation. *Choice D* is incorrect because "in comparison" illogically signals that the action of closing the tower area is being compared to the discovery of concerning rotation described in the previous sentence. Instead, closing the area around the tower to explore solutions occurred as a result of the measurements revealing the rotation.

QUESTION 28

Choice D is the best answer. "Specifically" logically signals that the information in this sentence—that the Local Bubble's expansion trapped clouds of gas and dust that formed new stars—provides specific, precise details elaborating on the more general information in the previous sentence about the relationship between the Local Bubble's expansion and the formation of new stars.

Choice A is incorrect because "hence" illogically signals that the information in this sentence is a result of the information in the previous sentence about the relationship between the Local Bubble's expansion and the formation of new stars. Instead, this sentence provides specific, precise details elaborating on that information. *Choice B* is incorrect because "however" illogically signals that the information in this sentence contrasts with the information in the previous sentence about the relationship between the Local Bubble's expansion and the formation of new stars. Instead, this sentence provides specific, precise details elaborating on that information. *Choice C* is incorrect because "admittedly" illogically signals that the information in this sentence provides an exception or caveat to the previous information about the relationship between the Local Bubble's expansion and the formation of new stars. Instead, this sentence provides specific, precise details elaborating on that information.

QUESTION 29

Choice A is the best answer. "In particular" logically signals that the information in this sentence—that maize and wheat supply chains transformed North American foodways into a global food system—provides specific, precise details elaborating on the more general information in the previous sentence about the transformation of North American foodways (with maize and wheat the "certain grains" at the center of it).

Choice B is incorrect because "alternatively" illogically signals that the information in this sentence is an alternative option to the previous information about the transformation of North American foodways. Instead, the roles of maize and wheat in creating a global food system are specific, precise details elaborating on that information. *Choice C* is incorrect because "by comparison" illogically signals that the information in this sentence is being compared to the previous information about the transformation of North American foodways. Instead, the roles of maize and wheat in creating a global food system are specific, precise details elaborating on that information. *Choice D* is incorrect because "second of all" illogically signals that the information in this sentence is a second, separate claim from the previous claim that North American foodways were transformed. Instead, the roles of maize and wheat in creating a global food system are specific, precise details elaborating on that information, rather than a separate claim.

QUESTION 30

Choice D is the best answer. "To that end" logically signals that the information in this sentence—the students' creation of a show with six starring female roles—is the product of a goal or desire in the previous sentence (the students' wish to develop a musical with roles for female actors).

Choice A is incorrect because "in other words" illogically signals that the information in this sentence is a paraphrase or restatement of the previous information about the students' wish to develop a musical with roles for female actors. Instead, the students' show is the product of that desire. *Choice B* is incorrect because "in summary" illogically signals that the information in this sentence summarizes the previous information about the students' wish to

develop a musical with roles for female actors. Instead, the students' show is the product of that desire. *Choice C* is incorrect because "for example" illogically signals that the information in this sentence is merely an example of the previous information about the students' wish to develop a musical with roles for female actors. Instead, the students' show is the direct product of that desire.

QUESTION 31

Choice C is the best answer. "More often" logically signals that the claim in this sentence—that new via ferratas favor recreation over utility—explains a difference between the new "sporting activity" routes and the older "mode of travel" routes. In so doing, it emphasizes and reinforces the previous claim ("modern via ferratas are rarely designed to simply reach a summit").

Choice A is incorrect because "additionally" illogically signals that this sentence's claim about new via ferratas adds a new, separate point to the previous claim ("modern via ferratas are rarely designed to simply reach a summit"). Instead, the second claim—that new routes favor recreation over utility—emphasizes and reinforces the previous one. *Choice B* is incorrect because "on the other hand" illogically signals that this sentence's claim about new via ferratas contrasts with or opposes the previous claim ("modern via ferratas are rarely designed to simply reach a summit"). Instead, the second claim—that new routes favor recreation over utility—emphasizes and reinforces the previous one. *Choice D* is incorrect because "nonetheless" illogically signals that this sentence's claim about new via ferratas is true despite the previous claim ("modern via ferratas are rarely designed to simply reach a summit"). Instead, the second claim—that new routes favor recreation over utility—emphasizes and reinforces the previous one.

QUESTION 32

Choice A is the best answer. The sentence indicates the title of a novel that won a Nebula Award, noting that *Babel-17* by Samuel Delany won the award in 1967.

Choice B is incorrect because the sentence identifies the year that Samuel Delany published a science fiction novel; it doesn't indicate the novel's title or that it won a Nebula Award. *Choice C* is incorrect because the sentence provides an introduction of Samuel Delany; it doesn't indicate the title of a novel that has won a Nebula Award. *Choice D* is incorrect because the sentence indicates that one of Samuel Delany's novels met the qualification for a Nebula Award; it doesn't indicate the novel's title or that it won an award.

QUESTION 33

Choice C is the best answer. The sentence indicates the year *Yosemite Falls* was completed, stating that it was completed in 1930.

Choice A is incorrect. The sentence indicates where Obata created black ink paintings; it doesn't indicate when the painting was completed. *Choice B* is incorrect. While the sentence identifies Obata as an artist who created a notable painting, it doesn't indicate when that painting was completed. *Choice D* is incorrect. The sentence identifies the method Obata used; it doesn't indicate when the painting was completed.

Math

Module 1
(27 questions)

QUESTION 1

Choice B is correct. In the given scatterplot, the *x*-values represent the distance above sea level, in feet, and the *y*-values represent the temperature, in °F. The point on the line of best fit with an *x*-value of 4,000 has a corresponding *y*-value of 35. Therefore, at a distance of 4,000 feet above sea level, the temperature predicted by the line of best fit is 35°F.

Choice A is incorrect. This is the temperature, in °F, predicted by the line of best fit at a distance of 0 feet above sea level. *Choice C* is incorrect. This is the measured temperature, in °F, at a distance of 6,000 feet above sea level. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice D is correct. It's given that rectangle P has an area of 72 square inches. If a rectangle with an area of 20 square inches is removed from rectangle P, the area, in square inches, of the resulting figure is $72 - 20$, or 52.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice B is correct. Subtracting 61 from each side of the given equation yields $|p| = 4$. By the definition of absolute value, if $|p| = 4$, then $p = 4$ or $p = -4$. Of the given choices, 4 is a solution to the given equation.

Choice A is incorrect. This is the quotient, not the difference, of 65 and 61. *Choice C* is incorrect. This is the sum, not the difference, of 65 and 61. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 4

Choice A is correct. It's given that p represents the number of pounds of strawberries Lorenzo purchased and Lorenzo paid $1.90 per pound for the strawberries. It follows that the total amount, in dollars, Lorenzo paid for strawberries can be represented by $1.90p$. It's given that Lorenzo paid $2 for the box of cereal. If Lorenzo paid a total of $9.60 for the box of cereal and strawberries, it follows that the equation $1.90p + 2 = 9.60$ can be used to find p.

Choice B is incorrect and may result from conceptual errors. *Choice C* is incorrect and may result from conceptual errors. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 5

Choice D is correct. It's given that the bar graph summarizes the charge, in kilowatt-hours (kWh), a battery received each day for 15 days. The height of each bar in the bar graph shown represents the number of days the battery received the charge, in kWh, specified at the bottom of the bar. The bar for a charge of 0 kWh reaches a height of 6. Therefore, the battery received a charge of 0 kWh for 6 of these days.

Choice A is incorrect. This is the charge, in kWh, that the battery received, not the number of days the battery received this charge. *Choice B* is incorrect. This is the number of days the battery received a charge of either 8, 16, or 23 kWh. *Choice C* is incorrect. This is the number of days the battery received a charge of 11 kWh.

QUESTION 6

The correct answer is 9. It's given that the equation $y = px + r$ defines the line. In this equation, p represents the slope of the line and r represents the y-coordinate of the y-intercept of the line. It's given that the line has a slope of 9. Therefore, the value of p is 9.

QUESTION 7

The correct answer is either 14, -5, or -4. The x-intercepts of a graph in the xy-plane are the points at which the graph intersects the x-axis, or when the value of y is 0. Substituting 0 for y in the given equation yields $0 = 3(x - 14)(x + 5)(x + 4)$. Dividing both sides of this equation by 3 yields $0 = (x - 14)(x + 5)(x + 4)$. Applying the zero product property to this equation yields three equations: $x - 14 = 0$, $x + 5 = 0$, and $x + 4 = 0$. Adding 14 to both sides of the equation $x - 14 = 0$ yields $x = 14$, subtracting 5 from both sides of the equation $x + 5 = 0$ yields $x = -5$, and subtracting 4 from both sides of the equation $x + 4 = 0$ yields $x = -4$. Therefore, the x-coordinates of the x-intercepts of the graph of the given equation are 14, -5, and -4. Note that 14, -5, and -4 are examples of ways to enter a correct answer.

QUESTION 8

Choice A is correct. It's given that the graph shown gives the estimated value y, in dollars, of a tablet as a function of the number of months since it was purchased, x. The y-intercept of a graph is the point at which the graph intersects the y-axis, or when x is 0. The graph shown intersects the y-axis at the point $(0, 225)$. It follows that 0 months after the tablet was purchased, or when the tablet was purchased, the estimated value of the tablet was 225 dollars. Therefore, the best interpretation of the y-intercept is that the estimated value of the tablet was \$225 when it was purchased.

Choice B is incorrect. The estimated value of the tablet 24 months after it was purchased was \$50, not \$225. *Choice C* is incorrect. The estimated value of the tablet had decreased by $\$225 - \$50$, or \$175, not \$225, in the 24 months after it was purchased. *Choice D* is incorrect and may result from conceptual errors.

QUESTION 9

Choice B is correct. It's given that triangles EFG and JKL are congruent such that angle E corresponds to angle J. Corresponding angles of congruent triangles are congruent, so angle E and angle J must be congruent. Therefore, if the measure of angle E is 45°, then the measure of angle J is also 45°.

Choice A is incorrect. This is the measure of angle K, not angle J. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 10

Choice D is correct. It's given that the function f is defined by $f(x) = \frac{1}{2}(x + 6)$. Substituting 4 for x in the given function yields $f(4) = \frac{1}{2}(4 + 6)$, or $f(4) = 5$. Therefore, the value of $f(4)$ is 5.

Choice A is incorrect. This is the value of $2(4 + 6)$, not $\frac{1}{2}(4 + 6)$. *Choice B* is incorrect. This is the value of $2 + (4 + 6)$, not $\frac{1}{2}(4 + 6)$. *Choice C* is incorrect. This is the value of $4 + 6$, not $\frac{1}{2}(4 + 6)$.

QUESTION 11

Choice C is correct. The solution to a system of two equations corresponds to the point where the graphs of the equations intersect. The graphs of the linear function and the absolute value function shown intersect at a point with an x-coordinate between -4 and -3 and a y-coordinate between 4 and 5. Of the given choices, only $\left(-\frac{7}{2}, \frac{9}{2}\right)$ has an x-coordinate between -4 and -3 and a y-coordinate between 4 and 5.

Choice A is incorrect. This is the y-intercept of the graph of the linear function. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the vertex of the graph of the absolute value function.

QUESTION 12

Choice D is correct. It's given that the system has infinitely many solutions. A system of two linear equations has infinitely many solutions when the two linear equations are equivalent. When one equation is a multiple of another equation, the two equations are equivalent. Multiplying each side of the given equation by 2 yields $2(y)=2(6x+3)$. Thus, $2(y)=2(6x+3)$ is equivalent to the given equation and could be the second equation in the system.

Choice A is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice B* is incorrect. The system consisting of this equation and the given equation has one solution rather than infinitely many solutions. *Choice C* is incorrect. The system consisting of this equation and the given equation has no solutions rather than infinitely many solutions.

QUESTION 13

The correct answer is 294. Subtracting 18 from each side of the given equation yields $\frac{6}{7}p=36$. Multiplying each side of this equation by $\frac{7}{6}$ yields $p=42$. Multiplying each side of this equation by 7 yields $7p=294$. Therefore, the value of $7p$ is 294.

QUESTION 14

The correct answer is 3. It's given that $y=9x+12$. Substituting $9x+12$ for y in the second equation in the system, $x+7y=20$, yields $x+7(9x+12)=20$, which gives $x+63x+84=20$, or $64x+84=20$. Subtracting 84 from each side of this equation yields $64x=-64$. Dividing each side of this equation by 64 yields $x=-1$. Substituting -1 for x in the first equation in the system, $y=9x+12$, yields $y=9(-1)+12$, or $y=3$. Therefore, the value of y is 3.

QUESTION 15

Choice A is correct. For a circle in the *xy*-plane that has the equation $(x-h)^2+(y-k)^2=r^2$, where h, k, and r are constants, (h, k) is the center of the circle and the positive value of r is the radius of the circle. In the given equation, $h=13$ and $r^2=64$. Taking the square root of each side of $r^2=64$ yields $r=\pm 8$. Therefore, the center of the circle is at $(13, k)$ and the radius is 8.

Choice B is incorrect. This gives the center and radius of a circle with equation $(x-k)^2+(y-13)^2=64$, not $(x-13)^2+(y-k)^2=64$. *Choice C* is incorrect. This gives the center and radius of a circle with equation $(x-k)^2+(y-13)^2=4{,}096$, not $(x-13)^2+(y-k)^2=64$. *Choice D* is incorrect. This gives the center and radius of a circle with equation $(x-13)^2+(y-k)^2=4{,}096$, not $(x-13)^2+(y-k)^2=64$.

QUESTION 16

Choice C is correct. It's given that the function f is defined by $f(x)=|x-4x|$. It's also given that $f(5)-f(a)=-15$. Substituting 5 for x in the function $f(x)=|x-4x|$ yields $f(5)=|5-4(5)|$ and substituting a for x in the function $f(x)=|x-4x|$ yields $f(a)=|a-4a|$. Therefore, $f(5)=15$ and $f(a)=|-3a|$. Substituting 15 for $f(5)$ and $|-3a|$ for $f(a)$ in the equation $f(5)-f(a)=-15$ yields $15-|-3a|=-15$. Subtracting 15 from both sides of this equation yields $-|-3a|=-30$. Dividing both sides of this equation by -1 yields $|-3a|=30$. By the definition of absolute value, if $|-3a|=30$, then $-3a=30$ or $-3a=-30$. Dividing both sides of each of these equations by -3 yields $a=-10$ or $a=10$, respectively. Thus, of the given choices, a value of a that satisfies $f(5)-f(a)=-15$ is 10.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 17

Choice B is correct. Each of the given choices is an equation of the form $f(x)=a(b)^{x-k}$, where a, b, and k are constants. For an equation of this form, the coefficient, a, is equal to the value of the function when the exponent is equal to 0, or when $x=k$. It follows that in the equation $f(x)=33(1.5)^x$, the coefficient, 33, is equal to the value of $f(0)$. Substituting 0 for x in this equation yields $f(0)=33(1.5)^0$, which is equivalent to $f(0)=33(1)$, or $f(0)=33$. Thus, the value of c is 33 and the equation $f(x)=33(1.5)^x$ shows the value of c as the coefficient.

Choice A is incorrect. This equation shows the value of $f(-1)$, not $f(0)$, as the coefficient. *Choice C* is incorrect. This equation shows the value of $f(1)$, not $f(0)$, as the coefficient. *Choice D* is incorrect. This equation shows the value of $f(2)$, not $f(0)$, as the coefficient.

QUESTION 18

Choice B is correct. It's given that t minutes after an initial observation, the number of bacteria in a population is $40{,}000(2)^{\frac{t}{790}}$. This expression consists of the initial number of bacteria, 40,000, multiplied by the expression $2^{\frac{t}{790}}$. The time, in minutes, it takes for the number of bacteria to double is the increase in the value of t that causes the expression $2^{\frac{t}{790}}$ to double. Since the base is 2, the expression $2^{\frac{t}{790}}$ will double when the exponent increases by 1. Since the exponent of this expression is $\frac{t}{790}$, the exponent will increase by 1 when t increases by 790. Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Alternate approach: The initial number of bacteria in the population can be found by substituting 0 for t in the given function. This yields $f(0)=40{,}000(2)^{\frac{0}{790}}$, or $f(0)=40{,}000$. Therefore, the initial number of bacteria present in the population is 40,000, so the bacteria population will have doubled when $f(t)=80{,}000$.

Substituting 80,000 for $f(t)$ in the given function yields $80{,}000 = 40{,}000(2)^{\frac{t}{790}}$. Dividing both sides of this equation by 40,000 yields $2 = 2^{\frac{t}{790}}$, or $2^1 = 2^{\frac{t}{790}}$. It follows that $1 = \frac{t}{790}$. Multiplying both sides of this equation by 790 yields $790 = t$. Therefore, the time, in minutes, it takes for the number of bacteria in the population to double is 790.

Choice A is incorrect. This is the base of the exponent, not the time it takes for the number of bacteria in the population to double. *Choice C* is incorrect. This is the number of minutes it takes for the population to double twice. *Choice D* is incorrect. This is the number of bacteria that are initially observed, not the time it takes for the number of bacteria in the population to double.

QUESTION 19

Choice D is correct. Adding $\frac{2}{t}$ to each side of the given equation yields $\frac{12}{n} = -\frac{2}{w} + \frac{2}{t}$. The fractions on the right side of this equation have a common denominator of tw; therefore, the equation can be written as $\frac{12}{n} = \frac{2w}{tw} - \frac{2t}{tw}$, or $\frac{12}{n} = \frac{2w-2t}{tw}$, which is equivalent to $\frac{12}{n} = \frac{2(w-t)}{tw}$. Dividing each side of this equation by 2 yields $\frac{6}{n} = \frac{w-t}{tw}$. Since n, t, w, and $w-t$ are all positive quantities, taking the reciprocal of each side of the equation $\frac{6}{n} = \frac{w-t}{tw}$ yields an equivalent equation: $\frac{n}{6} = \frac{tw}{w-t}$. Multiplying each side of this equation by 6 yields $n = \frac{6tw}{w-t}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is equivalent to $\frac{1}{n}$ rather than n.

QUESTION 20

The correct answer is 5. For the graph shown, x represents time, in minutes, and y represents temperature, in degrees Celsius (°C). Therefore, the average rate of change, in °C per minute, of the recorded temperature of the air in the chamber between two x-values is the difference in the corresponding y-values divided by the difference in the x-values. The graph shows that at $x = 5$, the corresponding y-value is 14. The graph also shows that at $x = 7$, the corresponding y-value is 24. It follows that the average rate of change, in °C per minute, from $x = 5$ to $x = 7$ is $\frac{24-14}{7-5}$, which is equivalent to $\frac{10}{2}$, or 5.

QUESTION 21

The correct answer is 87. It's given that in August, the car dealer completed 15 more than 3 times the number of sales the car dealer completed in September. Let x represent the number of sales the car dealer completed in September. It follows that $3x + 15$ represents the number of sales the car dealer completed in August. It's also given that in August and September, the car dealer completed 363 sales. It follows that $x + (3x + 15) = 363$, or $4x + 15 = 363$. Subtracting 15 from each side of this equation yields $4x = 348$. Dividing each side of this equation by 4 yields $x = 87$. Therefore, the car dealer completed 87 sales in September.

QUESTION 22

Choice B is correct. Since it's given that P is the center of a circle with a radius of 9 inches, and that points Q and R lie on that circle, it follows that $\overline{PQ}$ and $\overline{RP}$ of triangle PQR each have a length of 9 inches. Let the length of $\overline{QR}$ be x inches. It follows that the perimeter of triangle PQR is $9+9+x$ inches. Since it's given that the perimeter of triangle PQR is 31 inches, it follows that $9+9+x=31$, or $18+x=31$. Subtracting 18 from both sides of this equation gives $x=13$. Therefore, the length, in inches, of $\overline{QR}$ is 13.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 23

Choice A is correct. It's given that the four odd integers are consecutive, ordered from least to greatest, and that the first odd integer is represented by x. It follows that the second odd integer is represented by $x+2$, the third odd integer is represented by $x+4$, and the fourth odd integer is represented by $x+6$. Therefore, the product of 12 and the fourth odd integer is represented by $12(x+6)$, and 26 less than the sum of the first and third odd integers is represented by $x+(x+4)-26$. Since the product of 12 and the fourth odd integer is at most 26 less than the sum of the first and third odd integers, it follows that $12(x+6)\leq x+(x+4)-26$.

Choice B is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 24

Choice B is correct. The linear relationship between x and y can be represented by an equation of the form $y-y_1=m(x-x_1)$, where m is the slope of the graph of the equation in the xy-plane and (x_1, y_1) is a point on the graph. The slope of a line can be found using two points on the line and the slope formula $m=\frac{y_2-y_1}{x_2-x_1}$. Each value of x and its corresponding value of y in the table can be represented by a point (x, y). Substituting the points $(-s, 21)$ and $(s, 15)$ for (x_1, y_1) and (x_2, y_2), respectively, in the slope formula yields $m=\frac{15-21}{s-(-s)}$, which gives $m=\frac{-6}{2s}$, or $m=-\frac{3}{s}$. Substituting $-\frac{3}{s}$ for m and the point $(s, 15)$ for (x_1, y_1) in the equation $y-y_1=m(x-x_1)$ yields $y-15=-\frac{3}{s}(x-s)$. Distributing $-\frac{3}{s}$ on the right-hand side of this equation yields $y-15=-\frac{3x}{s}+3$. Adding 15 to each side of this equation yields $y=-\frac{3x}{s}+18$. Multiplying each side of this equation by s yields $sy=-3x+18s$. Adding $3x$ to each side of this equation yields $3x+sy=18s$. Therefore, the equation $3x+sy=18s$ represents this relationship.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice C is correct. The sine of an angle is equal to the cosine of its complementary angle. Since angles with measures 24° and 66° are complementary to each other, $\sin 24°$ is equal to $\cos 66°$ and $\sin 66°$ is equal to $\cos 24°$. Substituting $\cos 66°$ for $\sin 24°$ and $\cos 24°$ for $\sin 66°$ in the given expression yields $(\cos 66°)(\cos 66°)+(\cos 24°)(\cos 24°)$, or $(\cos 66°)^2+(\cos 24°)^2$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice A is correct. It's given that the cost of renting a carpet cleaner is $52 for the first day and $26 for each additional day. Therefore, the cost $C(d)$, in dollars, of renting the carpet cleaner for d days is the sum of the cost for the first day, $52, and the cost for the additional $d-1$ days, 26. It follows that $C(d)=52+26(d-1)$, which is equivalent to $C(d)=52+26d-26$, or $C(d)=26d+26$.

Choice B is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is $78, not $52, for the first day and $26 for each additional day. *Choice C* is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is $26, not $52, for the first day and $52, not $26, for each additional day. *Choice D* is incorrect. This function gives the cost of renting a carpet cleaner for d days if the cost is $130, not $52, for the first day and $52, not $26, for each additional day.

QUESTION 27

The correct answer is $-\frac{13}{2}$. The value of x for which $f(x)$ reaches its minimum can be found by rewriting the given equation in the form $f(x)=(x-h)^2+k$, where $f(x)$ reaches its minimum, k, when the value of x is h. The given equation, $f(x)=(x-2)(x+15)$, can be rewritten as $f(x)=x^2+13x-30$. By completing the square, this equation can be rewritten as $f(x)=\left(x^2+13x+\left(\frac{13}{2}\right)^2\right)-30-\left(\frac{13}{2}\right)^2$, which is equivalent to $f(x)=\left(x+\frac{13}{2}\right)^2-\frac{289}{4}$, or $f(x)=\left(x-\left(-\frac{13}{2}\right)\right)^2-\frac{289}{4}$. Therefore, $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that -13/2 and -6.5 are examples of ways to enter a correct answer.

Alternate approach: The graph of $y=f(x)$ in the xy-plane is a parabola. The value of x for the vertex of a parabola is the x-value of the midpoint between the two x-intercepts of the parabola. Since it's given that $f(x)=(x-2)(x+15)$, it follows that the two x-intercepts of the graph of $y=f(x)$ in the xy-plane occur when $x=2$ and $x=-15$, or at the points $(2, 0)$ and $(-15, 0)$. The midpoint between two points, (x_1, y_1) and (x_2, y_2), is $\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$. Therefore, the midpoint between $(2, 0)$ and $(-15, 0)$ is $\left(\frac{2-15}{2}, \frac{0+0}{2}\right)$, or $\left(-\frac{13}{2}, 0\right)$. It follows that $f(x)$ reaches its minimum when the value of x is $-\frac{13}{2}$. Note that -13/2 and -6.5 are examples of ways to enter a correct answer.

Math

Module 2
(27 questions)

QUESTION 1

Choice A is correct. It's given that a total of 165 people contributed to a charity event as either a donor or a volunteer. It's also given that 130 people contributed as a donor. It follows that $165 - 130$, or 35, people contributed as a volunteer.

Choice B is incorrect. This is the number of people who contributed as a donor, not a volunteer. *Choice C* is incorrect. This is the total number of people who contributed as either a donor or a volunteer, not the number of people who contributed as a volunteer. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 2

Choice B is correct. It's given that there are 250 trees in a park and of these trees, 6% are birch trees. The number of birch trees in the park can be calculated by multiplying the number of trees in the park by $\frac{6}{100}$. Therefore, the number of birch trees in the park is $250\left(\frac{6}{100}\right)$, or 15.

Choice A is incorrect. This is the percentage of trees in the park that are birch trees, not the number of birch trees in the park. *Choice C* is incorrect. This is 30%, not 6%, of 250. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 3

Choice C is correct. The vertex of the graph of a quadratic function in the *xy*-plane is the point at which the graph is either at its minimum or maximum *y*-value. In the graph shown, the minimum *y*-value occurs at the point $(0, 2)$.

Choice A is incorrect. The graph shown doesn't pass through the point $(0, -2)$.
Choice B is incorrect. The graph shown doesn't pass through the point $(0, -3)$.
Choice D is incorrect. The graph shown doesn't pass through the point $(0, 3)$.

QUESTION 4

Choice A is correct. It's given that there are 2,358 raccoons in a 131-square-mile area. The estimated population density, in raccoons per square mile, is the estimated number of raccoons divided by the number of square miles. Therefore, the estimated population density of this area is $\frac{2{,}358 \text{ raccoons}}{131 \text{ square miles}}$, or 18 raccoons per square mile.

Choice B is incorrect. This is the number of square miles in the area, not the estimated number of raccoons per square mile in this area. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 5

Choice B is correct. The probability of selecting a positive number is the number of positive numbers in the data set divided by the total number of numbers in the data set. There is 1 positive number in this data set. There are 3 total numbers in this data set. Thus, if a number from this data set is selected at random, the probability of selecting a positive number is $\frac{1}{3}$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This is the probability of selecting a negative number from this data set. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 6

The correct answer is 2,850. It's given that the function $f(x) = 45x + 600$ gives the monthly fee, in dollars, a facility charges to keep x crates in storage. Substituting 50 for x in this function yields $f(50) = 45(50) + 600$, or $f(50) = 2{,}850$. Therefore, the monthly fee, in dollars, the facility charges to keep 50 crates in storage is 2,850.

QUESTION 7

The correct answer is $\frac{11}{4}$. It's given that the function f is defined by $f(x) = 5\left(\frac{1}{4} - x\right)^2 + \frac{11}{4}$. Substituting $\frac{1}{4}$ for x in this equation yields $f\left(\frac{1}{4}\right) = 5\left(\frac{1}{4} - \frac{1}{4}\right)^2 + \frac{11}{4}$, which is equivalent $f\left(\frac{1}{4}\right) = 5(0)^2 + \frac{11}{4}$, or $f\left(\frac{1}{4}\right) = \frac{11}{4}$. Therefore, the value of $f\left(\frac{1}{4}\right)$ is $\frac{11}{4}$. Note that 11/4 or 2.75 are examples of ways to enter a correct answer.

QUESTION 8

Choice C is correct. It's given that $8x = 6$. Multiplying each side of this equation by 9 yields $72x = 54$. Therefore, the value of $72x$ is 54.

Choice A is incorrect. This is the value of $4x$, not $72x$. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 9

Choice C is correct. Since x is a common factor of each term in the given expression, the given expression can be rewritten as $x(23x^2 + 2x + 9)$.

Choice A is incorrect. This expression is equivalent to $23x^3 + 46x^2 + 207x$.
Choice B is incorrect. This expression is equivalent to $207x^4 + 18x^3 + 9x$.
Choice D is incorrect. This expression is equivalent to $34x^3 + 34x^2 + 34x$.

QUESTION 10

Choice D is correct. The given expression can be rewritten as $(9x^3 + 6x^3) + 5x^2 + 5x + (7 - 5)$. Combining like terms in this expression yields $15x^3 + 5x^2 + 5x + 2$.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.

QUESTION 11

Choice D is correct. It's given that the equation $80S + 90C = 1{,}120$ represents this situation, where S is the number of square tokens won, C is the number of circle tokens won, and 1,120 is the total number of points the tokens are worth. It follows that $80S$ represents the total number of points the square tokens are worth. Therefore, each square token is worth 80 points. It also follows that $90C$ represents the total number of points the circle tokens are worth. Therefore, each circle token is worth 90 points. Since a circle token is worth 90 points and a square token is worth 80 points, then a circle token is worth $90 - 80$, or 10, more points than a square token.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect. This is the number of points a circle token is worth.
Choice C is incorrect. This is the number of points a square token is worth.

QUESTION 12

Choice D is correct. A line in the xy-plane that passes through the points (x_1, y_1) and (x_2, y_2) has a slope of $\frac{y_2 - y_1}{x_2 - x_1}$. The line of best fit shown passes approximately through the points $(1, 3.3)$ and $(7, 14.5)$. It follows that the slope of this best fit line is approximately $\frac{14.5 - 3.3}{7 - 1}$, which is equivalent to $\frac{11.2}{6}$, or approximately 1.87. Therefore, of the given choices, 2 is closest to the slope of the line of best fit shown.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.

QUESTION 13

The correct answer is 4.41. The area, A, of a circle is given by the formula $A = \pi r^2$, where r is the radius of the circle. It's given that the area of the circle is $b\pi$ square inches, where b is a constant, and the radius of the circle is 2.1 inches. Substituting $b\pi$ for A and 2.1 for r in the formula $A = \pi r^2$ yields $b\pi = \pi(2.1^2)$. Dividing both sides of this equation by π yields $b = 4.41$. Therefore, the value of b is 4.41.

QUESTION 14

The correct answer is 153. Since it's given that $\overline{PQ}$ is parallel to $\overline{XY}$ and angle Y is a right angle, angle ZQP is also a right angle. Angle ZPQ is complementary to angle XZY, which means its measure, in degrees, is $90 - 63$, or 27. Since angle XPQ is supplementary to angle ZPQ, its measure, in degrees, is $180 - 27$, or 153.

QUESTION 15

Choice C is correct. It's given that t represents the number of years since the account was opened. Therefore, $\frac{t}{10}$ represents the number of 10-year periods since the account was opened. Since the value of the account doubles during each of these 10-year periods, the value of the account can be found by multiplying the initial value by $\frac{t}{10}$ factors of 2. This is equivalent to $2^{\frac{t}{10}}$. It's given that the initial value of the account is $890. Therefore, the value of the account $M(t)$, in dollars, t years after the account was opened can be represented by $M(t) = 890(2)^{\frac{t}{10}}$.

Choice A is incorrect. This equation represents the value of an account if the value of the account halves, not doubles, every 10 years. *Choice B* is incorrect. This equation represents the value of an account if the value of the account decreases by 90%, not doubles, every 2, not 10, years. *Choice D* is incorrect. This equation represents the value of an account if the value of the account increases by a factor of 10, not doubles, every 2, not 10, years.

QUESTION 16

Choice A is correct. The inequality $y < x$ indicates that for any solution to the given system of inequalities, the value of x must be greater than the corresponding value of y. The inequality $x < 22$ indicates that for any solution to the given system of inequalities, the value of x must be less than 22. Of the given choices, only choice A contains values of x that are each greater than the corresponding value of y and less than 22. Therefore, for choice A, all the values of x and their corresponding values of y are solutions to the given system of inequalities.

Choice B is incorrect. The values in this table aren't solutions to the inequality $y < x$. *Choice C* is incorrect. The values in this table aren't solutions to the inequality $x < 22$. *Choice D* is incorrect. The values in this table aren't solutions to the inequality $y < x$ or the inequality $x < 22$.

QUESTION 17

Choice A is correct. For positive values of a, $\frac{a^m}{a^n} = a^{(m-n)}$, where m and n are integers. Since it's given that $h > 0$ and $q > 0$, this property can be applied to rewrite the given expression as $(h^{(15-5)})(q^{(7-21)})$, which is equivalent to $h^{10}q^{-14}$. For positive values of a, $a^{-n} = \frac{1}{a^n}$. This property can be applied to rewrite the expression $h^{10}q^{-14}$ as $(h^{10})\left(\frac{1}{q^{14}}\right)$, which is equivalent to $\frac{h^{10}}{q^{14}}$.

Choice B is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 18

Choice D is correct. Adding the second equation to the first equation in the given system of equations yields $3y - 3y = 4x + 9x + 17 - 23$, or $0 = 13x - 6$. Adding 6 to each side of this equation yields $6 = 13x$. Multiplying each side of this equation by 3 yields $18 = 39x$. Therefore, the value of $39x$ is 18.

Choice A is incorrect. This is the value of $-39x$, not $39x$. *Choice B* is incorrect. This is the value of $-13x$, not $39x$. *Choice C* is incorrect. This is the value of $13x$, not $39x$.

QUESTION 19

Choice B is correct. It's given that the function h estimates that the object is 3,364 feet above the ground when it's dropped at $t = 0$. Substituting 3,364 for $h(t)$ and 0 for t in the function h yields $3{,}364 = -16(0)^2 + b$, or $3{,}364 = b$. Substituting 3,364 for b in the function h yields $h(t) = -16t^2 + 3{,}364$. When the object hits the ground, its height will be 0 feet above the ground. Substituting 0 for $h(t)$ in $h(t) = -16t^2 + 3{,}364$ yields $0 = -16t^2 + 3{,}364$. Adding $16t^2$ to each side of this equation yields $16t^2 = 3{,}364$. Dividing each side of this equation by 16 yields $t^2 = 210.25$. Since the object will hit the ground at a positive number of seconds after it's dropped, the value of t can be found by taking the positive square root of each side of this equation, which yields $t = 14.50$. It follows that the function estimates the object will hit the ground approximately 14.50 seconds after being dropped.

Choice A is incorrect. The function estimates that 7.25 seconds after being dropped, the object's height will be $-16(7.25)^2 + 3{,}364$ feet, or 2,523 feet, above the ground. *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 20

The correct answer is 120. The solutions to a quadratic equation of the form $ax^2+bx+c=0$ can be calculated using the quadratic formula and are given by $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$. The given equation is in the form $ax^2+bx+c=0$, where $a=2$, $b=-8$, and $c=-7$. It follows that the solutions to the given equation are $x=\frac{8\pm\sqrt{(-8)^2-4(2)(-7)}}{2(2)}$, which is equivalent to $x=\frac{8\pm\sqrt{64+56}}{4}$, or $x=\frac{8\pm\sqrt{120}}{4}$. It's given that one solution to the equation $2x^2-8x-7=0$ can be written as $\frac{8-\sqrt{k}}{4}$. The solution $\frac{8-\sqrt{120}}{4}$ is in this form. Therefore, the value of k is 120.

QUESTION 21

The correct answer is 1,660. It's given that a line intersects two parallel lines, forming four acute angles and four obtuse angles. When two parallel lines are intersected by a transversal line, the angles formed have the following properties: two adjacent angles are supplementary, and alternate interior angles are congruent. Therefore, each of the four acute angles have the same measure, and each of the four obtuse angles have the same measure. It's also given that the measure of one of the acute angles is $(9x-560)°$. If two angles are supplementary, then the sum of their measures is 180°. Therefore, the measure of the obtuse angle adjacent to any of the acute angles is $(180-(9x-560))°$, or $(180-9x+560)°$, which is equivalent to $(-9x+740)°$. It's given that the sum of the measures of one of the acute angles and three of the obtuse angles is $(-18x+w)°$. It follows that $(9x-560)+3(-9x+740)=(-18x+w)$, which is equivalent to $9x-560-27x+2{,}220=-18x+w$, or $-18x+1{,}660=-18x+w$. Adding $18x$ to both sides of this equation yields $1{,}660=w$.

QUESTION 22

Choice B is correct. An equation that defines a linear function f can be written in the form $f(x)=mx+b$, where m and b are constants. It's given in the table that when $x=-4$, $f(x)=0$. Substituting -4 for x and 0 for $f(x)$ in the equation $f(x)=mx+b$ yields $0=m(-4)+b$, or $0=-4m+b$. Adding $4m$ to both sides of this equation yields $4m=b$. Substituting $4m$ for b in the equation $f(x)=mx+b$ yields $f(x)=mx+4m$. It's also given in the table that when $x=-\frac{19}{5}$, $f(x)=1$. Substituting $-\frac{19}{5}$ for x and 1 for $f(x)$ in the equation $f(x)=mx+4m$ yields $1=m\left(-\frac{19}{5}\right)+4m$, or $1=\frac{1}{5}m$. Multiplying both sides of this equation by 5 yields $m=5$. Substituting 5 for m in the equation $f(x)=mx+4m$ yields $f(x)=5x+4(5)$, or $f(x)=5x+20$. If $h(x)=f(x)-13$, substituting $5x+20$ for $f(x)$ in this equation yields $h(x)=(5x+20)-13$, or $h(x)=5x+7$.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect. This is an equation that defines the linear function f, not h.

QUESTION 23

Choice C is correct. It's given that $g(c+7)=\frac{c}{4}$. Therefore, for the given linear function g, when $x=c+7$, $g(x)=\frac{c}{4}$. Substituting $c+7$ for x and $\frac{c}{4}$ for $g(x)$ in $g(x)=b-15x$ yields $\frac{c}{4}=b-15(c+7)$. Applying the distributive property to the right-hand side of this equation yields $\frac{c}{4}=b-15c-105$. Adding $15c$ to both sides of this equation yields $\frac{c}{4}+15c=b-105$. Adding 105 to both sides of this equation yields $\frac{c}{4}+15c+105=b$, or $\frac{61c}{4}+105=b$. Therefore, the expression that represents the value of b is $\frac{61c}{4}+105$.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice B* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 24

Choice B is correct. It's given that angle Z in triangle XYZ is a right angle. Thus, side YZ is the leg opposite angle X and side XZ is the leg adjacent to angle X. The tangent of an acute angle in a right triangle is the ratio of the length of the leg opposite the angle to the length of the leg adjacent to the angle. It follows that $\tan X=\frac{YZ}{XZ}$. It's given that $\tan X=\frac{12}{35}$ and the length of side YZ is 24 units. Substituting $\frac{12}{35}$ for $\tan X$ and 24 for YZ in the equation $\tan X=\frac{YZ}{XZ}$ yields $\frac{12}{35}=\frac{24}{XZ}$. Multiplying both sides of this equation by $35(XZ)$ yields $12(XZ)=24(35)$, or $12(XZ)=840$. Dividing both sides of this equation by 12 yields $XZ=70$. The length XY can be calculated using the Pythagorean theorem, which states that if a right triangle has legs with lengths of a and b and a hypotenuse with length c, then $a^2+b^2=c^2$. Substituting 70 for a and 24 for b in this equation yields $70^2+24^2=c^2$, or $5{,}476=c^2$. Taking the square root of both sides of this equation yields $\pm 74=c$. Since the length of the hypotenuse must be positive, $74=c$. Therefore, the length of XY is 74 units. The perimeter of a triangle is the sum of the lengths of all sides. Thus, $(74+70+24)$ units, or 168 units, is the perimeter of triangle XYZ.

Choice A is incorrect and may result from conceptual or calculation errors. *Choice C* is incorrect. This would be the perimeter, in units, for a right triangle where the length of side YZ is 12 units, not 24 units. *Choice D* is incorrect and may result from conceptual or calculation errors.

QUESTION 25

Choice C is correct. It's given that in the xy-plane, the graph of the given equation is a circle. The equation of a circle in the xy-plane can be written in the form $(x-h)^2+(y-k)^2=r^2$, where (h, k) is the center of the circle and r is the length of the circle's radius. Subtracting $6y$ from both sides of the equation $x^2+14x+y^2=6y+109$ yields $x^2+14x+y^2-6y=109$. By completing the square, this equation can be rewritten as $\left(x^2+14x+\left(\frac{14}{2}\right)^2\right)+\left(y^2-6y+\left(\frac{-6}{2}\right)^2\right)=109+\left(\frac{14}{2}\right)^2+\left(\frac{-6}{2}\right)^2$. This equation

can be rewritten as $(x^2+14x+49)+(y^2-6y+9)=109+49+9$, or $(x+7)^2+(y-3)^2=167$. Therefore, $r^2=167$. Taking the square root of both sides of this equation yields $r=\sqrt{167}$ and $r=-\sqrt{167}$. Since r is the length of the circle's radius, r must be positive. Therefore, the length of the circle's radius is $\sqrt{167}$.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice B is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 26

Choice B is correct. It's given that the speed of a vehicle is increasing at a rate of 7.3 meters per second squared. It's given to use 1 mile = 1,609 meters. There are 60 seconds in 1 minute; therefore, 60^2 or 3,600 seconds squared is equal to 1 minute squared. It follows that the rate of 7.3 meters per second squared is equivalent to $\left(\frac{7.3 \text{ meters}}{1 \text{ second squared}}\right)\left(\frac{1 \text{ mile}}{1{,}609 \text{ meters}}\right)\left(\frac{3{,}600 \text{ seconds squared}}{1 \text{ minute squared}}\right)$, or approximately 16.33 miles per minute squared. The rate, in miles per minute squared, rounded to the nearest tenth is 16.3.

Choice A is incorrect and may result from conceptual or calculation errors.
Choice C is incorrect and may result from conceptual or calculation errors.
Choice D is incorrect and may result from conceptual or calculation errors.

QUESTION 27

The correct answer is 14. It's given by the first equation of the system of equations that $y=-2.5$. Substituting -2.5 for y in the second given equation, $y=x^2+8x+k$, yields $-2.5=x^2+8x+k$. Adding 2.5 to both sides of this equation yields $0=x^2+8x+k+2.5$. A quadratic equation of the form $0=ax^2+bx+c$, where a, b, and c are constants, has no real solutions if and only if its discriminant, b^2-4ac, is negative. In the equation $0=x^2+8x+k+2.5$, where k is a positive integer constant, $a=1$, $b=8$, and $c=k+2.5$. Substituting 1 for a, 8 for b, and $k+2.5$ for c in b^2-4ac yields $8^2-4(1)(k+2.5)$, or $64-4(k+2.5)$. Since this value must be negative, $64-4(k+2.5)<0$. Adding $4(k+2.5)$ to both sides of this inequality yields $64<4(k+2.5)$. Dividing both sides of this inequality by 4 yields $16<k+2.5$. Subtracting 2.5 from both sides of this inequality yields $13.5<k$. Since k is a positive integer constant, the least possible value of k is 14.