

## Answer Explanations

# SAT Practice Test #9

## Section 1: Reading Test

### QUESTION 1

**Choice D is the best answer.** Throughout the passage, the narrator describes a visit to her family’s ink shop. The narrator’s father and uncles are employed at the shop, and in the third and fifth paragraphs the narrator describes her father’s interactions with a customer. Her father praises the color, sound, and smell of an ink sample as indicators of the ink’s quality. This interaction leads the narrator to conclude in the last paragraph, “I was very proud to hear Father speak of our family’s ink this way.” Therefore, the passage is best summarized as a character’s visit to her family’s ink shop that deepens her appreciation of her family’s work.

Choice A is incorrect. Although the narrator’s arrival at her family’s ink shop does spark memories of her Precious Auntie, these memories center on Precious Auntie’s beliefs about creativity, including the conviction that inferior ink produces inferior thought. The narrator’s thoughts on Precious Auntie occur in the fourth paragraph, so choice A isn’t the best summary of the overall passage. Choice B is incorrect. Although the passage describes the narrator’s surprise visit to the ink shop and a reunion with her uncles, these events occur in the first paragraph. Therefore, choice B doesn’t provide the best summary of the passage as a whole. Choice C is incorrect because the narrator doesn’t make any reference to her father’s ambitions.

### QUESTION 2

**Choice B is the best answer.** In the fourth paragraph, the narrator recounts her Precious Auntie’s belief that “you can never be an artist if your work comes without effort.” Her Precious Auntie states that when the physical act of writing is done with an “inkstick along an inkstone,” this process requires an artist to “take the first step to cleansing your mind and your heart. You push and you ask yourself, What are my intentions? What is in my heart that matches my mind?” In the following paragraphs, the narrator recalls the pride she felt while listening to her father describe the high quality of the ink that her family had worked hard to produce. Therefore, a main theme of the passage is that quality is achieved through deliberate effort.

Choice A is incorrect. Although family relationships form a backdrop to the passage, the nurturing of these relationships isn't a main theme. Choice C is incorrect. Although the passage does emphasize that hard work produces higher quality writing than that which is produced through minimal work, the passage doesn't mention that hard work results in material compensation. Choice D is incorrect. Although the passage discusses the role of concentrated effort in creative expression, a main theme of the passage isn't that creativity needs to be expressed concretely.

### QUESTION 3

**Choice B is the best answer.** In the first sentence of the second paragraph, the narrator states: "I tried to notice everything so I could later tell GaoLing what I had seen." She then proceeds to describe the floors of the family's ink shop, the walls and display cases, and the various items for sale. According to the third paragraph, these include an inkstick "with a top shaped like a fairy boat," another inkstick with "a bird shape," and a collection of ink cakes "embellished with designs of peonies and bamboo." Therefore, throughout the passage, the narrator is portrayed as someone who is attuned to her immediate surroundings.

Choice A is incorrect. Although the narrator describes herself as shy, the people she interacts with aren't unfamiliar to her because they are members of her family whom she has met before. Choices C and D are incorrect because the narrator isn't portrayed as sympathetic to the needs of others (choice C) or anxious about her responsibilities (choice D).

### QUESTION 4

**Choice A is the best answer.** Big Uncle and Little Uncle offer Old Widow Lau and the narrator a seat at a table reserved for customers upon their arrival at the narrator's family's ink shop. According to the tenth sentence of the first paragraph, "Old Widow Lau refused their invitation three times, exclaiming that my father and uncles must be too busy for visitors." Old Widow Lau's rejection of the uncles' offer is characterized as insincere, as the next sentence of that paragraph shows that she doesn't actually want to leave the shop: "She made weak efforts to leave." Instead, her gestures are intended to inspire exaggerated insistence from the uncles, such that it isn't until the uncles' "fourth insistence, [that Old Widow Lau and the narrator] finally sat." Therefore, it can be most reasonably inferred from the passage that Old Widow Lau's reluctance to stay for tea is feigned because she isn't genuinely firm in her resolve.

Choice B is incorrect because the passage doesn't imply that Old Widow Lau's reluctance is inconsiderate or that the family has been planning her visit. Choice C is incorrect because the shop isn't unusually busy. Instead, only one customer is mentioned in the passage. Choice D is incorrect because the passage doesn't state or imply that Old Widow Lau is exhausted from her journey.

## QUESTION 5

**Choice C is the best answer.** The previous question asks what can be most reasonably inferred from the passage about Old Widow Lau's reluctance to stay for tea. The answer, that her reluctance is feigned because she isn't genuinely firm in her resolve, is best supported by the tenth and eleventh sentences of the first paragraph: "Old Widow Lau refused their invitation three times, exclaiming that my father and uncles must be too busy for visitors. She made weak efforts to leave."

Choices A, B, and D are incorrect because the cited lines don't support the answer to the previous question. Instead, they describe the narrator and Old Widow Lau's arrival at the shop (choice A), their initial reception by the uncles (choice B), and the hospitality the uncles lavish on them once they are seated (choice D).

## QUESTION 6

**Choice A is the best answer.** In the second paragraph, the narrator describes the "shiny" glass display cases at her family's ink shop and how the silk-wrapped boxes of ink inside these cases "looked so much nicer [in the shop] than they had in the ink-making studio at Immortal Heart village." Therefore, the narrator indicates that the contrast between the ink-making studio at Immortal Heart village and her family's ink shop is that the ink shop displays the family's ink more impressively.

Choices B, C, and D are incorrect because the narrator doesn't state or imply that her family's ink shop, in comparison to the ink-making studio at Immortal Heart village, is more conveniently located for the public (choice B), provides greater individual attention to customers (choice C), or offers a larger space for presenting products (choice D).

## QUESTION 7

**Choice C is the best answer.** In the fourth paragraph, the narrator summarizes Precious Auntie's artistic philosophy: when you write without effort, "you do not have to think. You simply write what is swimming on the top of your brain. And the top is nothing but pond scum, dead leaves, and mosquito spawn." In other words, anything written too quickly, and therefore without concerted effort and thought, would be synonymous with the debris floating on top of a pool of water. Therefore, it is reasonable to infer that Precious Auntie would consider a hastily written first draft of a story to be essentially worthless in and of itself.

Choice A is incorrect because Precious Auntie's description of work made without effort is exclusively negative; therefore, it isn't reasonable to infer that she would praise a hastily written story draft as emotionally raw and powerful. Choice B is incorrect because Precious Auntie's artistic philosophy is concerned solely with the quality of the artist's output rather than with the satisfaction the artist experiences. Choice D is incorrect because whether a hastily produced work would be inappropriately analytical isn't discussed in the passage.

## QUESTION 8

**Choice C is the best answer.** The previous question asks what can be reasonably inferred about Precious Auntie’s view of a hastily written first draft of a story, based on the artistic philosophy expressed in the fourth paragraph. The answer, that she would consider such a story to be essentially worthless in and of itself, is best supported by the sixth and seventh sentences of the fourth paragraph, which describe Precious Auntie’s view of writing produced without effort: “You simply write what is swimming on the top of your brain. And the top is nothing but pond scum, dead leaves, and mosquito spawn.”

Choices A, B, and D are incorrect because the cited lines don’t support the answer to the previous question. Instead, they transition between the scene in the ink shop and the narrator’s memories of Precious Auntie (choice A), summarize Precious Auntie’s assessment of ink quality (choice B), and describe the process of creating good writing through concerted effort (choice D).

## QUESTION 9

**Choice B is the best answer.** In the last sentences of the fourth paragraph, the narrator describes Precious Auntie’s artistic philosophy, or, more specifically, the questions that an artist is forced to ask when working with concerted effort: “You push and you ask yourself, What are my intentions? What is in my heart that matches my mind?” With the second question, Precious Auntie highlights how an artist must strive to create work that resembles, or corresponds with, what is in both the artist’s heart and mind. Therefore, the word “matches,” as used in this sentence, most nearly means corresponds with.

Choices A, C, and D are incorrect because in the context of the passage, “matches” means corresponds with, not competes against (choice A), runs counter to (choice C), or treats equally (choice D).

## QUESTION 10

**Choice C is the best answer.** In the fifth paragraph, the narrator’s father demonstrates the quality of an inkstick to a customer. He strikes the inkstick, and the narrator describes “a sound as clean and pure as a small silver bell.” Therefore, the word “clean,” as used in this paragraph to describe a sound that the inkstick produced, most nearly means distinct, or clear.

Choices A, B, and D are incorrect because in the context of the passage, “clean” means distinct, not complete (choice A), skillful (choice B), or upright (choice D).

## QUESTION 11

**Choice D is the best answer.** The first paragraph of the passage introduces research by Harvard psychology professor Daniel Wegner demonstrating that the Internet is changing “the way our

memories function.” One finding of Wegner’s study, as stated in the second paragraph, is that “when people have access to search engines, they remember fewer facts and less information because they know they can rely on ‘search’ as a readily available shortcut.” In the third paragraph, Wegner claims that his study shows how “the Internet has become part of a transactive memory source, a method by which [humans’] brains compartmentalize information,” such that “computers and technology as well are becoming virtual extensions of [human] memory.” The remainder of the passage details Wegner’s experiments and findings. Thus, the main purpose of the passage is to share the findings of a study examining the effect of computer use on memory recall.

Choice A is incorrect. Although the author suggests in the sixth paragraph that technology may interfere with critical thinking, this isn’t the focus of Wegner’s experiments, nor is illustrating this position the main purpose of the passage. Choices B and C are incorrect because the passage doesn’t support the assertion that people have become overly dependent on computers for storing information (choice B) or that humans’ capacity for memory is much weaker than it once was (choice C).

## QUESTION 12

**Choice D is the best answer.** The fifth paragraph details the results of the fourth experiment of Wegner’s study, where participants were more likely to recall digital folder locations where statements they typed were saved than the actual statements themselves. The first sentence of the last paragraph summarizes why this result may not be alarming: “And even though we may not be taxing our memories to recall distinct facts, we are still using them to consider where the facts are located and how to access them.” In this sentence, the author paraphrases Wegner’s view that although human memory is changing as a result of technology, this doesn’t indicate that human memory is declining, as people are relying on their memory to access specific types of information. Therefore, this sentence best supports the idea that reliance on computers doesn’t necessarily diminish human memory.

Choices A, B, and C are incorrect because the cited lines don’t support the idea that reliance on computers doesn’t necessarily diminish human memory. Instead, they introduce the topic of Wegner’s research (choice A), provide examples of the types of information that people may now rely on the Internet to provide (choice B), and concede that the Internet may diminish critical thinking skills (choice C).

## QUESTION 13

**Choice D is the best answer.** In the third paragraph, the author outlines Wegner’s theory of a “transactive memory source.” According to Wegner, transactive memory is a “network of memory,” where an individual can access information that he or she can’t personally

recall from a particular source. The author illustrates this idea in the second sentence of this paragraph, with the example of “a husband [who] relies on his wife to remember a relative’s birthday.” Thus, the reference to remembering a relative’s birthday mainly serves to illustrate the concept of a transactive memory source using a familiar situation.

Choice A is incorrect. Although the situation of a husband relying on his wife’s memory does suggest that closely related people tend to have shared memories, this isn’t the main purpose of this reference in the context of the passage. Choice B is incorrect because the example doesn’t demonstrate how people initially developed external sources of memory. Choice C is incorrect because the function of the example isn’t to emphasize the effectiveness and accuracy of transactive memory sources. Instead, its function is to make the abstract concept of transactive memory more easily understandable.

## QUESTION 14

**Choice B is the best answer.** In the third paragraph, Wegner describes transactive memory as a “network of memory where you don’t have to remember everything in the world yourself.” Instead, the burden of storing information is shifted to transactive memory sources that can function as “extensions of [human] memory.” Examples of sources provided in the fourth paragraph of the passage include cell phones, GPS devices, and search engines. What these examples have in common is that they store information, such as phone numbers, directions, and general knowledge, so that a person doesn’t have to commit this information to memory. A written list of a user’s passwords for different websites serves the same function as these examples. Although remembering a list of passwords for different websites is conceivable without a list, keeping such a list shifts the burden of storing readily memorable information away from the user because the list preserves the information in place of the user’s memory. Therefore, based on the passage, a written list of a user’s passwords for different websites would be considered a transactive memory source.

Choices A, C, and D are incorrect because they don’t accurately exemplify transactive memory sources. A souvenir brought home from a memorable trip (choice A) may evoke memories of that place for the owner. However, it doesn’t preserve actual information in the way the examples provided in the passage do. A library database that helps users locate specific books (choice C) may seem similar to a search engine. However, it doesn’t store information that would otherwise be readily memorable in the way that a search engine can help a user remember an actor’s name or a detail of geography, according to the fourth paragraph of the passage. Instead, it helps a library patron navigate a system that is typically far too vast to be committed to memory. A website that helps users plan and make travel arrangements



(choice D) may help facilitate transactions in the form of ticket purchases or hotel reservations. However, it doesn't store information that the user would otherwise memorize.

## QUESTION 15

**Choice B is the best answer.** In the last sentence of the third paragraph, the author states that “computers and technology . . . are becoming virtual extensions of our memory.” In other words, computers and technology are becoming memory sources that serve as additions to human memory. Thus, “extensions of,” as used in the passage, most nearly means additions to.

Choices A, C, and D are incorrect because in the context of the passage, “extensions of” means additions to, not delays in (choice A), lengths of (choice C), or developments of (choice D).

## QUESTION 16

**Choice C is the best answer.** The fifth paragraph of the passage describes four experiments that Wegner conducted to demonstrate his theory of a transactional memory source. The first experiment, described in the second sentence of this paragraph, found that participants “were more likely to think of computer terms like ‘Yahoo’ or ‘Google’ after being asked a set of difficult trivia questions.” The second, third, and fourth experiments explored participants’ tendency to remember the location of information rather than the information itself. Therefore, the discussion of the experiments, most specifically the first experiment, suggests that people are inclined to think of specific information sources in response to being asked to provide facts that aren’t already familiar to them.

Choice A is incorrect. Although some of the subjects in the second experiment did memorize information that later became inaccessible, this act of memorization didn’t cause the subjects to think of specific information sources. Choice B is incorrect. Although participants in the fourth experiment were told their work would be saved in specific folders, they weren’t directed to develop a system for organizing and saving content. Choice D is incorrect because none of the experiments involved participants being prompted to identify terms related to dependence on computers.

## QUESTION 17

**Choice A is the best answer.** The previous question asks, based on Wegner’s experiments, when people would be inclined to think of specific information sources. The answer, that being asked to provide facts that aren’t already familiar to them provokes this response, is best supported by the second sentence of the fifth paragraph: “In the first experiment, participants demonstrated that they were more likely to think of computer terms like ‘Yahoo’ or ‘Google’ after being asked a set of difficult trivia questions.”

Choices B, C, and D are incorrect because the cited lines don't support the answer to the previous question. Instead, they describe the different parameters for the participants in the second and third experiments (choice B), summarize the results of the second and third experiments (choice C), and summarize the results of the fourth experiment (choice D).

### QUESTION 18

**Choice A is the best answer.** The second sentence of the sixth paragraph states: "Students who have trouble remembering distinct facts, for example, may struggle to employ those facts in critical thinking." In other words, students who find it difficult to remember information may find it challenging to utilize that information to develop logical arguments. Therefore, the word "employ," as used in the context of this sentence, most nearly means utilize.

Choices B, C, and D are incorrect because in the context of the passage, "employ" means utilize, not enroll (choice B), exert (choice C), or assign (choice D).

### QUESTION 19

**Choice C is the best answer.** The passage explains that in the fourth experiment participants were given statements and folder locations where they were told those statements would be saved. On the graph, the bar farthest to the left represents those who remembered both elements of the information given to them during the experiment. This bar rises to a point midway between 15% and 20%. Therefore, according to the graph, approximately 17% of participants remembered both parts of the information given to them during the fourth experiment.

Choice A is incorrect because none of the groups represented on the graph comprised 7% of participants. Choices B and D are incorrect because neither 10% (choice B) nor 30% (choice D) of participants remembered both elements of the information given to them during the fourth experiment. Instead, 10% remembered statements but not folder locations (according to the second bar from the left), while 30% remembered folder locations but not statements (according to the third bar from the left).

### QUESTION 20

**Choice D is the best answer.** The largest single group of participants represented on the graph is composed of those who remembered nothing, as indicated by the bar that is farthest to the right. Why approximately 40% of participants could not remember the statements or the folder locations isn't explained by the description of the fourth experiment in the fifth paragraph of the passage. Therefore, the



most likely explanation for the findings regarding the largest single group of participants represented on the graph is that there isn't enough information to determine the cause of the results for those participants.

Choices A, B, and C are incorrect because these speculations aren't supported by the passage. There isn't enough information provided about the fourth experiment to know whether the participants who could remember nothing focused on remembering the folder locations (choice A), attempted to remember the statements and the folder locations (choice B), or didn't attempt to remember any specific pieces of information (choice C).

## QUESTION 21

**Choice A is the best answer.** Throughout the passage, the author describes experiments conducted on guppies to determine the guppies' rate of and types of evolutionary change. The first paragraph outlines the reason why these fish were an optimal choice for this research: their "unstinting rate of reproduction makes guppies ideally suited for studying the rate of evolution." Therefore, the first paragraph mainly serves to establish the reason why a certain species was selected for scientific observation.

Choice B is incorrect because the purpose of the first paragraph isn't to illustrate the value of studying the offspring of a particular animal shortly after birth. Instead, guppies were selected because of their rapid rate of reproduction and weren't only studied shortly after being born, according to the passage. Choices C and D are incorrect. Although the fourth paragraph does introduce a new method of scientific inquiry (experimental evolution), the first paragraph doesn't mainly serve to introduce a theory at the center of an ongoing scientific debate (choice C) or offer a rationale for the prevalence of a new field of scientific inquiry (choice D).

## QUESTION 22

**Choice B is the best answer.** The third sentence of the second paragraph states, "A lucky guppy is born above a waterfall or a set of rapids, which keep out the predatory fish called pike cichlids found in calmer downstream waters." In other words, pike cichlids normally eat guppies, but waterfalls and rapids can create natural barriers that prevent these predators from entering certain areas where guppies live. Thus, in describing the living conditions of guppies, the author indicates that a "lucky guppy" is one that inhabits an environment that provides natural protection from predators.

Choices A and C are incorrect because the author doesn't indicate that being born in a major river with an established guppy population is an advantage for a guppy (choice A) or that there are risks associated with living near a waterfall or that guppies benefit by avoiding such risks (choice C). Choice D is incorrect because the author doesn't indicate that there is an advantage for guppies living in calmer

downstream waters. Instead, the author notes that calmer downstream waters are where guppies' predators live, making these zones more dangerous for guppies than the areas above waterfalls or rapids.

### QUESTION 23

**Choice D is the best answer.** In the last paragraph, the author describes an experiment in which Reznick's team removed groups of guppies from areas with large populations of pike cichlid predators and relocated them into areas above waterfalls and rapids. According to the second sentence of this paragraph, "Although small predatory killifish occurred in these new sites, these fish do not pose anything close to the danger of the cichlids." This sentence provides the best evidence for the conclusion that the streams used by Reznick's team were not entirely free of predators, as they contained populations of killifish.

Choices A, B, and C are incorrect because the cited lines don't provide the best evidence for the conclusion that the streams used by Reznick's team were not entirely free of predators. Instead, they explain the advantage for guppies living above waterfalls or rapids (choice A), outline the correlation between numbers of pike cichlids and guppy mortality rates (choice B), and explain the growing popularity of "experimental evolution" among scientists (choice C).

### QUESTION 24

**Choice A is the best answer.** According to the fourth paragraph, the existence of streams in Trinidad with populations of guppies and those without guppies led Reznick to the conclusion that he could conduct experiments by altering the guppy populations in various streams. According to the second sentence of the fourth paragraph, Reznick realized he could "treat streams like giant test tubes by introducing guppies or predators' to places they had not originally occurred, and then watch as natural selection acted on the guppies." Reznick uses the phrase "giant test tubes" in this sentence to suggest that certain streams can provide suitable experimental conditions for his guppy research.

Choices B, C, and D are incorrect because the phrase "giant test tubes" serves to characterize certain streams as suitable for experimental research, not to suggest that those streams promote cooperative behaviors among guppies used as subjects in experimental studies (choice B), increase the rate of genetic change among guppies (choice C), or assist scientists in solving environmental problems in the natural habitat of guppies (choice D).

### QUESTION 25

**Choice C is the best answer.** The fourth paragraph describes Reznick's rationale for moving populations of guppies from one body of water to another. The last sentence of the paragraph states, "This kind of real-world manipulation of nature is called 'experimental evolution,'

and it is growing increasingly popular among scientists working with organisms that reproduce quickly enough for humans to be able to see the outcome within our lifetimes.” In other words, the fact that this type of research is “growing increasingly popular” means that it is becoming more widespread. Thus, the word “popular” as used in the passage most nearly means widespread.

Choices A, B, and D are incorrect because in the context of the passage, “popular” means widespread, not accessible (choice A), suitable (choice B), or likable (choice D).

## QUESTION 26

**Choice B is the best answer.** Reznick’s team found that guppies, when moved from predator-ridden environments to a site where there was not the same level of predation, “evolved to mature later, and have fewer, bigger offspring in each litter, just like the guppies that naturally occurred in the cichlid-free streams,” according to the fourth sentence of the last paragraph. If it were discovered that the new site into which Reznick released the guppies were inhabited by fish found to be as predatory as the cichlids in the original sites, this discovery would undermine Reznick’s findings. Such a finding would mean that the pressure of predation on the guppies remained constant from one site to the next. As a consequence, some other factor or factors would be responsible for the developmental changes in the guppies that Reznick’s team recorded.

Choice A is incorrect. If guppies examined in other parts of the globe were found to exhibit genetic shifts in traits at a different rate from the guppies Reznick examined, these findings would not undermine his research because they would have occurred outside the confines of his experimental conditions. Choice C is incorrect. If experimental evolution were shown to be harmful to the environment, this finding, though important, would not undermine Reznick’s findings. Choice D is incorrect. If the descendants of Reznick’s transplanted fish were proven to mature later than the guppies living below the waterfall, this finding would support, rather than undermine, Reznick’s findings.

## QUESTION 27

**Choice A is the best answer.** The last sentence of the passage states, “Other studies of guppies in Trinidad have shown evolutionary change in as few as two and a half years, or a little over four generations, with more time required for genetic shifts in traits such as the ability to form schools and less time for changes in the colorful spots and stripes on a male’s body.” That is, certain traits, such as physical markings, seem to change more quickly than other traits, such as aspects of group behavior. Thus, it can most reasonably be inferred from the passage that the experiments in Trinidad have shown that some genetic traits will evolve more readily than others.

Choices B, C, and D are incorrect because the experiments in Trinidad led to conclusions about guppies' rate of evolutionary changes. These experiments did not lead to an identification of other dangerous predators (choice B), an analysis of how certain guppies thrive better in predator-ridden environments (choice C), or an examination as to how evolutionary changes can be prevented in a natural environment (choice D).

## QUESTION 28

**Choice D is the best answer.** The previous question asks what can most reasonably be inferred about guppies based on the experiments in Trinidad described in the passage. The answer, that some guppy genetic traits will evolve more readily than others, is best supported by the last sentence of the passage: "Other studies of guppies in Trinidad have shown evolutionary change in as few as two and a half years, or a little over four generations, with more time required for genetic shifts in traits such as the ability to form schools and less time for changes in the colorful spots and stripes on a male's body."

Choices A, B, and C are incorrect because the cited lines don't support the answer to the previous question. Instead, they pose a question central to Reznick's research (choice A), describe the conditions that led Reznick to consider conducting experimental evolution tests in Trinidad (choice B), and describe how Reznick's team removed guppies from one area and reintroduced them in another (choice C).

## QUESTION 29

**Choice D is the best answer.** The number of offspring produced by guppies living in the south slope high-predation environment is indicated by the first bar from the left in figure 1. This bar rises to a point midway between 6 and 7 on the graph. Therefore, according to figure 1, guppies living in the south slope high-predation environment produced a mean number of offspring between 6 and 7.

Choice A is incorrect because 2 to 3 offspring were produced by guppies living in the south slope low-predation environment, rather than those living in the high-predation environment, as indicated by the second bar from the left in figure 1. Choice B is incorrect because 3 to 4 offspring were produced by guppies living in the north slope low-predation environment, rather than guppies living in the south slope high-predation environment, as indicated by the bar that is farthest to the right in figure 1. Choice C is incorrect because none of the groups represented in figure 1 produced 5 to 6 offspring.

## QUESTION 30

**Choice C is the best answer.** The graph shows that the mean embryo mass in a low-predation environment for south slope guppies (second bar from the left) is higher than mean embryo mass in a

high-predation environment for south slope guppies (bar farthest to the left). A similar relationship exists for north slope guppies, as the mean embryo mass in a low-predation environment (bar farthest to the right) is higher than the mean embryo mass in a high-predation environment (third bar from the left). Meanwhile, a comparison of south slope high-predation environments (bar farthest to the left) to north slope high-predation environments shows no difference in mean embryo mass. The graph shows that while there is a slightly lower mean embryo mass in north slope low-predation environments (bar farthest to the right) than in south slope low-predation environments (second bar from the left), this difference is only 0.2 mg, which is considerably less than the difference that results from comparing the low- and high-predation environments in each of the two locations. Therefore, the conclusion about the mean mass of guppy embryos that is best supported by figure 2 is that the predation level observed in each environment had more of an effect on mean embryo mass than did slope location.

Choice A is incorrect because slope location wasn't a better indicator of mean embryo mass than was the predation level observed in each environment. Instead, the mean masses of embryos in the two locations were roughly equivalent. Choice B is incorrect because the mean embryo mass of guppies born in the north slope environments didn't exceed the mean embryo mass of guppies born in the south slope environments. Guppies living in high-predation environments in both north and south slope locations had embryos with the same mass, while those living on the north slope in low-predation environments had embryos with a slightly lower mass than that of south slope guppies in low-predation environments. Therefore, the mean embryo mass of guppies born in the south slope environment exceeded the mean embryo mass of guppies born in the north slope environment. Choice D is incorrect because guppies born in low-predation environments didn't have a mean embryo mass less than that of guppies born in high-predation environments. Instead, these guppies had a greater mass.

## QUESTION 31

**Choice B is the best answer.** Figure 1 shows that guppies from low-predation environments (represented on the graph by second and fourth bars from the left) had smaller litters, or fewer guppy offspring, than did guppies from high-predation environments (represented by the first and third bars from the left). Similarly, figure 2 shows that guppies from low-predation environments (the second and fourth bars from the left) also had embryos with a greater mean mass than did guppies from high-predation environments (the first and third bars from the left).

Choice A is incorrect. Although figure 1 does support the conclusion that guppies from low-predation environments have fewer offspring than those from high-predation environments, neither figure indicates the time required for guppies to reach full maturity. Choice C is incorrect because neither figure indicates the survival rate of guppies,

and figure 2 directly contradicts the conclusion that guppies from low-predation environments have less mean embryo mass than those from high-predation environments. Choice D is incorrect. Although figure 2 supports the conclusion that guppies from low-predation environments have a greater mean embryo mass than those from high-predation environments, figure 1 directly contradicts the conclusion that guppies from low-predation environments produce a greater number of offspring than those from high-predation environments.

### QUESTION 32

**Choice D is the best answer.** In the passage, Sara T. Smith addresses the Second Anti-Slavery Convention of American Women. In the second sentence of the first paragraph, Smith states that confronting slavery is “a question of justice” and that it involves “considerations of immense importance to the welfare and prosperity of our country.” In the third paragraph, Smith argues that women shouldn’t be deterred from participating in the abolitionist cause. In the last paragraph, she argues that women “cannot remain inactive” in confronting slavery as “our country is as dear to us as to the proudest statesman. . . . Let our course, then, still be *onward!*” Therefore, Smith’s main purpose in the passage is to encourage women to see their participation in the abolitionist cause as just and important.

Choices A and C are incorrect because Smith doesn’t accuse fellow abolitionists of overlooking the contributions that women have made to the movement (choice A) or make the case that women’s rights are meaningless while slavery exists (choice C). Choice B is incorrect. Although Smith quotes the Declaration of Independence in the third paragraph, the main purpose of the passage isn’t to argue that the causes of abolition and women’s rights are continuations of the spirit of the American Revolution.

### QUESTION 33

**Choice A is the best answer.** Throughout the passage, Smith poses questions that aren’t answered explicitly until the last paragraph, but the leading tone of the speech makes it clear that the implied answer to these questions is “no.” In the second paragraph, Smith questions her critics’ claim that upholding humanitarian values undermines conventional feminine virtues. In the third paragraph, she wonders how women can “have no interest” in the subject of slavery when it could lead to the destruction of their families through war. In the last paragraph, she asks women numerous questions and then answers them with a “no.” Thus, a technique that Smith uses throughout the passage to advance her main point is to present her claims in the form of rhetorical questions that mostly have implicit negative answers.

Choice B is incorrect. Although Smith questions the assertions that her opponents made, she doesn’t criticize her opponents themselves by quoting self-contradictory remarks they have made. Choice C



is incorrect. Although Smith makes use of vivid language and imagery throughout the passage, she doesn't illustrate each of her central ideas with an emotionally powerful anecdote. Choice D is incorrect. Although it is implied that Smith considers her views to be reasonable, she doesn't present them as universally held.

## QUESTION 34

**Choice B is the best answer.** In the first sentence of the passage, Smith introduces the argument that slavery is a “political question” and therefore not “within the ‘province of woman.’” In the second sentence, Smith voices her opposition to this argument: “It is not true that [slavery] is *merely* a political question, it is likewise a question of justice, of humanity, of morality, of religion.” In other words, slavery is too broad a problem to be classified solely as “political,” in Smith's view. However, in the fourth paragraph, Smith returns to the political aspect of the argument at hand by addressing how women must engage in the subject of slavery on a political scale. She argues that “admitting [slavery] to be a political question” doesn't mean that women have “no interest in the welfare of our country,” as women must criticize slavery and its “unjust laws” and seek to stop the nation's “downward course” by choosing to not “remain inactive.” Therefore, Smith develops her argument about slavery as a “political question” over the course of the passage by dismissing the designation as too narrow but then demonstrates its relevance to her audience.

Choice A is incorrect. Although Smith does offer alternative ways of defining the problem of slavery, she doesn't claim that the designation of slavery as a “political question” is outdated, but rather that it is insufficient. Choice C is incorrect because Smith doesn't contend that the designation of slavery as a “political question” has become trite, nor does she invite her audience to revitalize it. Choice D is incorrect. Although Smith's argument is intertwined with questions of gender roles, she doesn't describe the meaning the designation of a “political question” has for men and then challenge women to embrace it.

## QUESTION 35

**Choice B is the best answer.** In the first sentence of the passage, Smith relays a claim: “We are told that it is not within the ‘province of woman,’ to discuss the subject of slavery; that it is a ‘political question,’ and we are ‘stepping out of our sphere,’ when we take part in its discussion.” In the next sentence, Smith rejects this claim: “It is not true that it is *merely* a political question, it is likewise a question of justice, of humanity, of morality, of religion.” She then argues that the subject of slavery “involves considerations of immense importance to the welfare and prosperity of our country, enters deeply into the home-concerns, the every-day feelings of millions of our fellow beings” and expands upon this point by providing an example of the difference, under slavery, between laborers who are enslaved and those

who are within the “dignity of conscious manhood.” Therefore, the best summary of the first paragraph is that Smith rejects a claim and elaborates on her reasons for doing so.

Choice A is incorrect. Although Smith may outline a conventional viewpoint in the first paragraph, she doesn’t present evidence to support it. Choice C is incorrect. Although Smith introduces her subject in the first paragraph, she doesn’t provide historical background for understanding it. Choice D is incorrect. Although Smith does identify a problem in the first paragraph, she doesn’t propose steps to remedy it.

### QUESTION 36

**Choice A is the best answer.** In the first sentence of the second paragraph, Smith relays the sentiment, presumably voiced by those opposed to women abolitionists, that “woman ‘can take no part [in the debate over slavery] without losing something of the modesty and gentleness which are her most appropriate ornaments.’” Smith opposes this view in the following sentence: “must woman necessarily be less gentle because her heart is open to the claims of humanity, or less modest because she feels for the degradation of her enslaved sisters, and would stretch forth her hand for their rescue?” The leading tone of this rhetorical question makes it clear that Smith would answer it with a “no.” Thus, Smith argues that it is possible for women to act according to humanitarian principles while preserving their femininity.

Choices B, C, and D are incorrect because Smith doesn’t argue that it is possible for women to adhere to personal morality while being politically neutral (choice B), contribute to their family’s financial security while meeting social expectations (choice C), or resist calls for war while still opposing slavery (choice D).

### QUESTION 37

**Choice A is the best answer.** The previous question asks which activity Smith argues it is possible for women to engage in. The answer, that she argues that women can act according to humanitarian principles while preserving their femininity, is best supported in the last sentence of the second paragraph: “must woman necessarily be less gentle because her heart is open to the claims of humanity, or less modest because she feels for the degradation of her enslaved sisters, and would stretch forth her hand for their rescue?” The leading tone of this rhetorical question makes it clear that Smith would answer it with a “no.” In other words, Smith believes that women can uphold humanitarian principles while maintaining conventional feminine virtues.

Choices B, C, and D are incorrect because the cited lines don’t support the answer to the previous question. Instead, they link women’s conventional domestic concerns with the losses that would be incurred by a war over slavery (choice B), affirm that the potential horrors of

war are enough to stir women out of a state of political inactivity (choice C), and equate women's patriotism with that of male political leaders (choice D).

### QUESTION 38

**Choice C is the best answer.** In the first sentence of the third paragraph, Smith states “by the Constitution of the United States, the whole physical power of the North is pledged for the suppression of domestic insurrections, and should the slaves, maddened by oppression, endeavor to shake off the yoke of the taskmaster, the men of the North are bound to make common cause with the tyrant, and put down, at the point of the bayonet, every effort on the part of the slave, for the attainment of his freedom.” In other words, according to Smith, if slaves were to revolt, the US Constitution would require that Northern states help the slave states fight the slaves' rebellion.

Choices A, B, and D are incorrect because Smith doesn't argue that if the slaves were to revolt the US Constitution would require the Northern states to sever ties with the slave states (choice A), give shelter to refugees from the slave states (choice B), or provide financial assistance to the rebelling slaves (choice D).

### QUESTION 39

**Choice D is the best answer.** The word “tyrant” describes a cruel and unfair ruler. It is first used in the first sentence of the third paragraph, when Smith argues that in the event of a slave rebellion in the slave states, “the men of the North are bound to make common cause with the tyrant, and put down, at the point of the bayonet, every effort on the part of the slave, for the attainment of his freedom.” The word occurs again in the seventh sentence of the last paragraph, when Smith asserts the strength of women's “aspirations that every inhabitant of our land may be protected . . . by just and equal laws” so that “the foot of the tyrant may no longer invade the domestic sanctuary.” In both instances, the word “tyrant” is used to represent slaveholders and their allies. Thus, Smith's use of “tyrant” emphasizes the unjustness of slavery.

Choice A is incorrect because Smith's use of the word “tyrant” doesn't identify a specific individual as oppressive. Instead, it refers to all those individuals who profit from and abet the unjust institution of slavery. Choice B is incorrect because Smith's use of the word “tyrant” doesn't highlight the threat of aggression from abroad. Instead, it highlights national injustice. Choice C is incorrect because Smith's use of the word “tyrant” doesn't critique the limited roles for women in antislavery movements. Smith's use of the word “tyrant” refers to slaveholders and their allies, not those who would discourage women's participation in the antislavery movement.

## QUESTION 40

**Choice C is the best answer.** In the last sentence of the third paragraph, Smith argues that the threat of a war precipitated by slavery “is of itself sufficient to arouse the slumbering energies of woman” to speak out against slavery’s injustice. In other words, women have the potential to protest slavery, but they have been relatively inactive, or dormant, up until now. Therefore, the word “slumbering,” as used in this sentence, most nearly means dormant.

Choices A, B, and D are incorrect because in the context of the passage, “slumbering” means dormant, not lethargic (choice A), drowsy (choice B), or unconscious (choice D).

## QUESTION 41

**Choice A is the best answer.** The fifth sentence of the last paragraph poses the following question: “Shall we silently behold the land which we love with all the heart-warm affection of children, rendered a hissing and a reproach throughout the world, by this system which is already tolling the death-bell of her decease among the nations?” In other words, the continuation of slavery in the United States is being criticized “throughout the world,” such that the existence of slavery affects the United States by lowering the country’s reputation in the international community.

Choice B is incorrect because Smith doesn’t suggest that slavery affects the United States by leading many women to disavow their allegiance to the country. Instead, she suggests that it is partly women’s patriotism that should stir them to protest slavery because it is lowering the reputation of the United States in the international community. Choice C is incorrect. Although Smith speaks ominously in the last paragraph of “the events of the last two years” that are “overclouding the bright prospects of the future,” she doesn’t cite any current violent conflicts in the country. Choice D is incorrect because Smith doesn’t suggest that slavery weakens the authority of the country’s government. Instead, she argues that it damages the country’s reputation abroad.

## QUESTION 42

**Choice C is the best answer.** The previous question asks how Smith most strongly suggests that slavery affects the United States. The answer, that slavery affects the United States by lowering the country’s reputation in the international community, is best supported by the fifth sentence of the last paragraph: “Shall we silently behold the land which we love with all the heart-warm affection of children, rendered a hissing and a reproach throughout the world, by this system which is already tolling the death-bell of her decease among the nations?”

Choices A, B, and D are incorrect because the cited lines don’t support the answer to the previous question. Instead, they suggest that because war affects home life, women are right to concern themselves

with the possibility of war (choice A), imply that women have a right to consider issues that fall outside the domestic sphere (choice B), and issue a call to action for women to voice condemnation of slavery (choice D).

### QUESTION 43

**Choice C is the best answer.** The first paragraph of Passage 1 presents a quote by biochemist Kim Lewis of Northeastern University: “Pathogens are acquiring resistance faster than we can introduce new antibiotics, and this is causing a human health crisis.” The rest of the passage describes Lewis’s research and the experimental antibiotic called teixobactin that her research has produced. According to the second paragraph of the passage, teixobactin has “proved effective at killing off a wide variety of disease-causing bacteria—even those that have developed immunity to other drugs.” Therefore, the first paragraph of Passage 1 primarily serves to identify a problem that the research discussed in the passage may help to address.

Choice A is incorrect because although the first paragraph quotes a claim by Lewis regarding antibiotic resistance, this claim isn’t developed over the course of Passage 1. Choice B is incorrect because the claim made in the first paragraph regarding antibiotic resistance isn’t presented as controversial, nor does Passage 1 attempt to resolve any scientific controversies. Choice D is incorrect because the claim made in Paragraph 1 isn’t presented as a theory; moreover, the findings in Passage 1 support this claim rather than challenge it.

### QUESTION 44

**Choice D is the best answer.** The third paragraph of Passage 1 describes how, historically, the development of antibiotics requires “natural microbial substances,” but this reliance has severe limitations as only about one percent of these microbial substances can be grown in a laboratory. The author goes on to explain how “the rest, in staggering numbers, have remained uncultured and of limited use to medical science, until now.” The paragraph then describes the method Lewis’s team used to grow teixobactin microorganisms “in their natural environment where they already have the conditions they need for growth.” Therefore, the author of Passage 1 suggests that an advantage of the method Lewis’s team used to grow microorganisms is that it allows researchers to make use of soil bacteria that they had previously been unable to exploit.

Choice A is incorrect because although the author of Passage 1 suggests that Lewis’s team identified the requirements for soil bacteria to thrive, the team didn’t replicate those features in artificial soil. Instead, the author suggests in the third and fourth paragraphs of Passage 1 that they used real soil samples. Choice B is incorrect because the author of Passage 1 doesn’t suggest that the method Lewis’s team used to grow microorganisms enabled soil bacteria to

take in more nutrients than they typically consume in natural settings. Instead, it can be inferred from the fourth paragraph of the passage that the bacteria were provided with the same nutrients they consume in natural settings. Choice C is incorrect because the last paragraph of Passage 1 explains that it isn't the method Lewis's team used to grow bacteria but the antibiotic the team created that affects the cell walls of bacteria.

### QUESTION 45

**Choice A is the best answer.** The previous question asks what advantage of the method Lewis's team used to grow microorganisms is suggested by the author of Passage 1. The answer, that this method allows researchers to make use of soil bacteria that they had previously been unable to exploit, is best supported by the first through third sentences of the third paragraph of Passage 1: "Natural microbial substances from soil bacteria and fungi have been at the root of most antibiotic drug development during the past century. But only about one percent of these organisms can be grown in a lab. The rest, in staggering numbers, have remained uncultured and of limited use to medical science, until now."

Choices B, C, and D are incorrect because the cited lines don't support the answer to the previous question. Instead, they describe the gadget that Lewis's team developed to grow microorganisms (choice B), explain how the team's technique affects the bacteria (choice C), and outline how teixobactin attacks harmful bacteria (choice D).

### QUESTION 46

**Choice D is the best answer.** In the first sentence of Passage 2, the author outlines the "long . . . suspected" belief that if researchers could "grow more types of bacteria from soil . . . then we might find new natural antibiotics." The author then explains how Lewis's team's technique that led to the development of teixobactin employed growing bacteria from soil. The author concludes in the last sentence of the first paragraph that Lewis's team's "simple and elegant methodology . . . opens a gateway to cultivating a wealth of potentially antibiotic-producing bacteria." Therefore, the author of Passage 2 would most likely agree with the statement that the development of teixobactin confirms a long-held belief about a potential source of new antibiotics.

Choice A is incorrect because the author of Passage 2 wouldn't likely agree with the statement that the development of teixobactin reveals that some antibiotics are effective against gram-negative bacteria. The author mentions gram-negative bacteria in the third paragraph to highlight teixobactin's ineffectiveness in combating it, not to discuss other antibiotics that are effective against gram-negative bacteria. Choice B is incorrect because the author wouldn't likely agree with the statement that the development of teixobactin shows that conventional methods can still yield new types of antibiotics. Instead, the author



contends that the unconventional method used to produce teixobactin may yield new types of antibiotics. Choice C is incorrect because the author wouldn't likely agree with the statement that the development of teixobactin casts doubt on the practicality of searching for new antibiotics in exotic environments. Rather, in the first paragraph of Passage 2, the author states that exotic environments might yield new antibiotics.

### QUESTION 47

**Choice C is the best answer.** In the first sentence of the last paragraph of Passage 2, the author expresses reservations about the immediate usefulness of teixobactin: "So, what are my caveats? Well, I see three. First, teixobactin isn't a potential panacea. . . . Secondly, scaling to commercial manufacture will be challenging. . . . And, thirdly . . . teixobactin now faces the long haul of clinical trials." The author uses the word "caveats" to introduce skeptical comments about teixobactin's value. Thus, the word "caveats," as used in the first sentence of the last paragraph of Passage 2, most nearly means misgivings.

Choices A, B, and D are incorrect because in the context of the passage, "caveats" means misgivings, not exceptions (choice A), restrictions (choice B), or explanations (choice D).

### QUESTION 48

**Choice A is the best answer.** In the last paragraph of Passage 2, the author expresses reservations regarding teixobactin. One of these reservations is that the drug "now faces the long haul of clinical trials" before teixobactin can be made available for consumers. These clinical trials will be used to discover "what dose you can safely give the patient . . . if it cures infections, and . . . to compare its efficacy to that of 'standard of care treatment,'" and are "going to take five years and £500 million." Thus, the author uses the phrase "five years and £500 million" primarily to emphasize the scale of the effort needed to make teixobactin available for consumer use.

Choices B, C, and D are incorrect because the author of Passage 2 uses the phrase "five years and £500 million" as a reference to the time and financial commitment that will be required to make teixobactin available to the public. That being the case, the phrase doesn't imply criticism of the level of funding that the government has committed to teixobactin development (choice B), address the amount of time and money that has already been spent researching teixobactin (choice C), or compare the amount of money spent developing teixobactin with the amount spent developing other antibiotics (choice D).

### QUESTION 49

**Choice A is the best answer.** Passage 1 discusses research conducted by biochemist Kim Lewis. As described in the second paragraph of the passage, this research explored "a new way to tap the powers of

soil microorganisms” in the laboratory and led to the development of teixobactin, a promising new drug that could “function effectively for decades,” thereby addressing the problem of pathogens’ resistance to antibiotics. The author of Passage 2 critiques the research described in Passage 1. In the first paragraph of Passage 2, the author declares that the methodology Lewis and others developed “is their most important finding . . . for it opens a gateway to cultivating a wealth of potentially antibiotic-producing bacteria.” However, teixobactin “is less exciting” to the author of Passage 2 because it has proved ineffective at combating certain types of bacteria and large investments of time and money will be needed before it can be made available to the public at large, according to the second and third paragraphs of Passage 2. Therefore, the best description of the relationship between Passage 1 and Passage 2 is that Passage 2 offers an evaluation of the significance of the research discussed in Passage 1.

Choice B is incorrect because Passage 2 doesn’t suggest a modification to the methodology described in Passage 1. Instead, the author of Passage 2 embraces the “simple and elegant” methodology described in Passage 1. Choice C is incorrect because Passage 2 doesn’t use concrete examples to illustrate concepts considered in Passage 1. Instead, it evaluates the significance of the research. Choice D is incorrect because Passage 2 doesn’t take a dismissive stance regarding the findings mentioned in Passage 1. The author of Passage 2 endorses the methodology described in Passage 1, and concedes that teixobactin “doesn’t look bad,” while outlining some reservations about the drug’s value.

## QUESTION 50

**Choice B is the best answer.** The first paragraph of Passage 1 quotes biochemist Kim Lewis of Northeastern University: “Pathogens are acquiring resistance faster than we can introduce new antibiotics, and this is causing a human health crisis.” However, research conducted by Lewis has produced a drug called teixobactin, which has “proved effective at killing off a wide variety of disease-causing bacteria—even those that have developed immunity to other drugs,” according to the second sentence of the second paragraph of Passage 1. Similarly, in the third sentence of the second paragraph of Passage 2, the author of the passage states that teixobactin “killed the tuberculosis bacterium, which is important because there is a real problem with resistant tuberculosis in the developing world.” Therefore, both passages make the point that teixobactin could be useful in combating infections that are no longer responding to treatment with other antibiotics.

Choice A is incorrect because Passage 1 outlines the methodology used to produce teixobactin but doesn’t offer it as a model for future development of antibiotics produced in laboratory environments. Passage 2 suggests that future development of antibiotics may draw on the methodology that Lewis and others developed, but the passage doesn’t go so far as to suggest that teixobactin could be used to

standardize this development. Choices C and D are incorrect because neither passage makes the point that teixobactin could be useful in controlling the spread of pathogenic soil fungi (choice C) or in shaping a new method of studying the effectiveness of antibiotics (choice D).

## QUESTION 51

**Choice C is the best answer.** According to the last sentence of the fifth paragraph of Passage 1, “Mice infected with bacteria that cause upper respiratory tract infections . . . were treated with teixobactin, and the drug knocked out the infections with no noticeable toxic effects.” The second paragraph of Passage 2 explains that teixobactin was tested in a laboratory and killed gram-positive bacteria, but, according to the fourth sentence of the third paragraph, it “doesn’t kill the Gram-negative opportunists as it is too big to cross their complex cell wall.” Therefore, since teixobactin was not successful in eradicating gram-negative bacteria as stated in Passage 2, this information best supports the conclusion that the mice described in the experiment in Passage 1 had upper respiratory tract infections that were likely not caused by gram-negative bacteria since these infections were successfully treated by teixobactin.

Choices A, B, and D are incorrect because no information in Passage 2 supports the conclusion that the mice in the experiment described in Passage 1 were less susceptible to subsequent upper respiratory tract infections due to exposure to teixobactin (choice A), the gram-positive bacteria enhanced the effectiveness of teixobactin against the upper respiratory tract infections in the mice (choice B), or the teixobactin attacked the proteins of the bacteria that caused the upper respiratory tract infections in the mice.

## QUESTION 52

**Choice D is the best answer.** The previous question asks which conclusion about the mice in the experiment described in Passage 1 is best supported by information in Passage 2. The answer, that their upper respiratory tract infections were likely not caused by gram-negative bacteria, is best supported by the fourth sentence of the third paragraph of Passage 2: “[Teixobactin] doesn’t kill the Gram-negative opportunists as it is too big to cross their complex cell wall.”

Choices A, B, and C are incorrect because the cited lines don’t support the answer to the previous question. Instead, they provide a historical background to Lewis’s cultivation of soil bacteria (choice A), praise the methodology used by Lewis’s team and others (choice B), and introduce an evaluation of teixobactin (choice C).

## Section 2: Writing and Language Test

### QUESTION 1

**Choice B is the best answer.** The verb “watch” clearly and concisely indicates that scientists can view underwater volcanic eruptions “via remotely operated vehicles.”

Choices A, C, and D are incorrect because they’re repetitive. “Observe,” “see,” and “visually” unnecessarily reiterate the idea that scientists can view underwater volcanic eruptions.

### QUESTION 2

**Choice B is the best answer.** Sentence 5 should be placed after sentence 1. The phrase “at that depth” at the beginning of sentence 5 refers to the statement in sentence 1 that NW Rota-1’s summit is located “more than 1,700 feet under the ocean’s surface.” Furthermore, sentence 5 leads into sentence 2, which explains what scientists were able to determine about the volcano’s growth from remotely operated vehicles.

Choices A, C, and D are incorrect because placing sentence 5 anywhere in the paragraph other than after sentence 1 would create an illogical, confusing paragraph.

### QUESTION 3

**Choice A is the best answer.** The adverb “nevertheless” correctly indicates that despite the fact that sunlight doesn’t reach NW Rota-1, the bacteria there have adapted to the “perpetually dark environment” and “use hydrogen sulfide instead of sunlight” for energy.

Choices B, C, and D are incorrect because they don’t indicate the true relationship between the two independent clauses. “Afterward” indicates that one event happens after another. “Furthermore” suggests that additional information about what has been said earlier in the sentence will follow. “Similarly” indicates that a comparison is being made.

### QUESTION 4

**Choice C is the best answer.** The plural pronoun “them” agrees in number with the plural antecedent “bacteria.”

Choices A, B, and D are incorrect because they’re singular pronouns that don’t agree in number with the plural antecedent “bacteria.”

### QUESTION 5

**Choice D is the best answer.** The conjunction “and” followed by “other chemicals” results in a sentence with a parallel series of nouns.

Choices A, B, and C are incorrect because they don’t maintain the sentence’s parallel structure, and they unnecessarily repeat a form of the verb “remove.”

## QUESTION 6

**Choice C is the best answer.** The dashes after “shrimp” and “Hawaii” are used correctly to set off the nonessential information between them.

Choices A and B are incorrect because neither a comma nor a semicolon can be used with a dash to set off nonessential information. Choice D is incorrect because punctuation, in this case a dash, is needed after “Hawaii” to finish setting off the nonessential information.

## QUESTION 7

**Choice D is the best answer.** This choice’s reference to “predators” most effectively sets up the sentence that follows, which explains that, as adults, the previously unknown species of shrimp feeds on the Loihi shrimp.

Choices A, B, and C are incorrect because they don’t effectively set up the information in the sentence that follows. The following sentence doesn’t discuss the idea that the other species of shrimp is able to adapt to its noxious environment. Additionally, it doesn’t address the idea that scientists don’t yet understand the adaptations of the shrimp or that their unusual ecosystem also includes crabs, limpets, and barnacles.

## QUESTION 8

**Choice A is the best answer.** This choice most effectively combines the sentences at the underlined portion by creating a compound predicate using two parallel, singular, present tense verbs (“condenses” and “leaves”) to show that as the steam condenses only “carbon dioxide bubbles and droplets of molten sulfur” are left.

Choices B, C, and D are incorrect because they don’t effectively combine the sentences. The resulting sentences aren’t concise, and the verbs aren’t parallel.

## QUESTION 9

**Choice D is the best answer.** This choice results in a logical comparison between the water near NW Rota-1 and stomach acid.

Choices A and B are incorrect because the demonstrative pronouns “that” and “those” don’t have clear antecedents, leaving unclear what the water near NW Rota-1 is being compared to. Choice C is incorrect because it unnecessarily repeats the word “acid,” resulting in a nonsensical expression (“the acid from stomach acid”).

## QUESTION 10

**Choice C is the best answer.** The singular possessive noun “world’s” is used correctly to indicate that the plural noun “oceans” belongs to one world.

Choice A is incorrect because “worlds” is a plural possessive noun, and there is only one world being referred to. Furthermore, the possessive noun “ocean’s” is incorrect because nothing belongs to the ocean in this sentence. Choice B is incorrect because “oceans” is a possessive noun, and nothing belongs to “oceans” in this sentence. Choice D is incorrect because “worlds” is a plural noun, and this noun needs to be the singular possessive noun “world’s” to show that the oceans belong to one world.

### QUESTION 11

**Choice A is the best answer.** The writer should make the revision because it shows the relevance of the sentence about rising carbon dioxide levels in Earth’s atmosphere to the paragraph’s point about the increasing acidity of the world’s oceans.

Choice B is incorrect because the revision doesn’t help readers to understand why organisms near NW Rota-1 evolved the way they did. Choices C and D are incorrect because the revision should be made. The revision doesn’t repeat information, and it does contribute to the paragraph’s main idea. Furthermore, it doesn’t add an irrelevant detail that interrupts the discussion of oceanic life-forms.

### QUESTION 12

**Choice C is the best answer.** The comma after “ridership” is used correctly to separate the dependent clause that begins with the word “while” from the independent clause that follows “ridership.”

Choice A is incorrect because the conjunction “but” can’t join a dependent clause to an independent clause. Choice B is incorrect because the conjunctions “and while” create a second dependent clause, but an independent clause is needed to make the sentence complete. Choice D is incorrect because a semicolon can’t be used in this way to separate an introductory dependent clause from an independent clause.

### QUESTION 13

**Choice B is the best answer.** This choice is the most effective because it doesn’t repeat the word “people.” Furthermore, this choice’s use of the active voice, which indicates that “more people” (the subject of the sentence) use public transportation, eliminates unnecessary wording.

Choices A and C are incorrect because they unnecessarily repeat the noun “people.” Choice D is incorrect because the use of the passive voice, which changes the subject of the sentence from “more people” to “using public transportation,” creates a wordy sentence.



## QUESTION 14

**Choice B is the best answer.** The colon correctly introduces information that illustrates what has come before it. The independent clause that follows the colon indicates that “car traffic in Tallinn was down less than 3 percent,” which supports the statement before the colon that “car use in Tallinn has only slightly declined.”

Choice A is incorrect because the semicolon awkwardly joins an independent clause with the dependent clause that follows. Choice C is incorrect because it creates a comma splice. Choice D is incorrect because it creates a sentence fragment after the period.

## QUESTION 15

**Choice D is the best answer.** “The policy” clearly indicates what was enacted. The passage indicates that “car traffic in Tallinn was down less than 3 percent” since the policy of fare-free rides was enacted.

Choices A, B, and C are incorrect because the pronouns in these choices don’t have clear antecedents.

## QUESTION 16

**Choice A is the best answer.** This choice best introduces the paragraph; the phrase “devastating effect” sets up the paragraph’s discussion of how fare-free systems can negatively impact a city’s transportation budget.

Choices B, C, and D are incorrect because they don’t introduce the paragraph’s topic, which is the devastating effects of a fare-free system on a city’s budget. The paragraph doesn’t focus on changes in service, negative environmental impact, or increased crowding on public transportation.

## QUESTION 17

**Choice C is the best answer.** The comma after “savings” and the conjunction “but” are used correctly to connect the two independent clauses.

Choices A and B are incorrect because they each create a comma splice. Choice D is incorrect because the conjunction “and” signals additional information rather than the needed contrast.

## QUESTION 18

**Choice D is the best answer.** The expression “overly optimistic” is consistent with the formal tone of the passage.

Choices A, B, and C are incorrect. While “way too sunny,” “looking too much on the bright side,” and “pretty upbeat” all convey optimism, they’re colloquial expressions that don’t fit the formal tone of the passage.

### QUESTION 19

**Choice C is the best answer.** This choice provides an accurate interpretation because the chart indicates that the projected total additional operating costs for implementing a fare-free policy in San Francisco, CA, would be \$184 million per year.

Choices A, B, and D are incorrect because they don't accurately interpret the information provided in the chart for San Francisco, CA. The chart projects a cost of \$112 million in lost fares, not a deficit of \$72 million per year in lost fares (choice A) or a savings of \$112 million from lost fares (choice B). The chart projects a cost of \$72 million per year to add fare-free service, not a savings of \$72 million (choice D).

### QUESTION 20

**Choice C is the best answer.** The sentence shouldn't be added because the fact that Eugene, OR, "would lose only \$5 million" doesn't support the writer's argument that fare-free systems cause large financial losses to governments.

Choices A and B are incorrect. The sentence shouldn't be added because the fact that Eugene, OR, would lose only \$5 million in fares doesn't support the writer's argument against fare-free systems. Furthermore, it doesn't reinforce any claim made earlier in the paragraph by advocates of fare-free policies. Choice D is incorrect because the sentence doesn't contradict any point made earlier in the paragraph about fare collection.

### QUESTION 21

**Choice B is the best answer.** The present indicative verb "do [not] have" is consistent in tense and mood with the present indicative verb "can go" earlier in the sentence.

Choice A is incorrect because "would [not] have had" is a perfect conditional verb. Choice C is incorrect because "did [not] have" is a past indicative verb. Choice D is incorrect because "will [not] have" is a future indicative verb.

### QUESTION 22

**Choice D is the best answer.** This choice provides the best conclusion to the passage, which argues that fare-free transportation policies "have not been found to be an effective way to address traffic problems" and "may result in serious budget shortfalls."

Choices A, B, and C are incorrect because they don't provide the best conclusion to the passage. Choice A is too narrowly focused, and choices B and C make claims that aren't supported by information in the passage.

## QUESTION 23

**Choice B is the best answer.** The singular third person pronoun “it” correctly refers to the singular antecedent “digital camera.”

Choice A is incorrect because the plural pronoun “they” doesn’t agree in number with the singular antecedent “digital camera.” (It wouldn’t make sense here to assume that “they” refers to “professional photographers,” as there’s no clear indication that the photographers referred to used the earliest digital cameras.) Choice C is incorrect because the indefinite pronoun “one” doesn’t refer to a specific noun. Choice D is incorrect because the personal pronouns “he or she” refer to people, not things.

## QUESTION 24

**Choice B is the best answer.** To make the paragraph most logical, the new sentence “Why wouldn’t they?” should be placed after sentence 2. The pronoun “they” in the new sentence refers to the “vast majority” of professional photographers mentioned in sentence 2. Furthermore, the two sentences that follow the new sentence answer the question of why photographers would trade film for digital cameras by stating that the latest digital cameras take pictures that are “crisp,” “bright,” and “sharp.”

Choices A, C, and D are incorrect because placing the new sentence anywhere in the paragraph other than after sentence 2 would create an illogical and confusing paragraph.

## QUESTION 25

**Choice B is the best answer.** The new sentence should be added because its reference to “several intricate steps” sets up the process of wet plate photography discussed in the rest of the paragraph.

Choice A is incorrect. The sentence should be added, but it doesn’t reiterate the previous paragraph’s main idea. Choices C and D are incorrect because the sentence should be added. The new sentence doesn’t blur the paragraph’s focus on the dangers of developing wet plate photographs. It also doesn’t offer an opinion: while “labor-intensive” can be interpreted as an opinion, the description of the steps is factual.

## QUESTION 26

**Choice D is the best answer.** The plural possessive pronoun “their” agrees in number with the plural antecedent “photographers” and correctly indicates that the subjects belong to the photographers.

Choice A is incorrect because “it’s” is a contraction for “it is” and doesn’t make sense in the sentence. Choice B is incorrect because “its” is a singular possessive pronoun and doesn’t agree in number with the plural antecedent “photographers.” Choice C is incorrect because “there” isn’t a possessive pronoun.

## QUESTION 27

**Choice A is the best answer.** The coordinating conjunction “so” is used correctly to indicate that because dried collodion is unusable, a photographer has to work quickly to develop the film once the photo is taken.

Choices B, C, and D are incorrect because they don’t convey the intended cause-and-effect relationship between the two independent clauses. “But” (choice B) indicates that an exception or contrast to what was said previously will follow. “And” (choice C) suggests that the two clauses indicate separate ideas instead of a cause-and-effect relationship. “For” (choice D), used as a conjunction, means “because.” If used in this sentence, “for” would indicate that dried collodion is unusable because the photographer must quickly develop the photograph.

## QUESTION 28

**Choice D is the best answer.** The word “mere” most effectively suggests that the photographer has only a very brief time to develop wet plate photographs.

Choices A, B, and C are incorrect because they don’t accomplish the writer’s goal of emphasizing how quickly wet plate photographers must work. “Nominal” isn’t idiomatic when referring to a short amount of time. “A few” and “a matter of” can be used to describe time, but neither choice emphasizes how quickly wet plate photographers have to work.

## QUESTION 29

**Choice B is the best answer.** The adverb “finally” correctly indicates that the last step in the process of wet plate photography is to coat the photo with a protective finish.

Choices A, C, and D are incorrect because they don’t indicate that the final step in a process will follow. “In conclusion” is used to introduce a summary of what has previously been said. “Thus” indicates that a result of what has been previously stated will follow. “Nevertheless” is used to introduce a contrast to what has been stated earlier.

## QUESTION 30

**Choice D is the best answer.** No punctuation is needed in the sentence except for a period.

Choice A is incorrect because the parentheses indicate that the information between them could be deleted without changing the meaning of the sentence. In this sentence, the information in the parentheses contains the direct object of the verb “give” and is essential. Choice B is incorrect because the dash wrongly indicates that the information following is being emphasized. Choice C is incorrect because the commas indicate that the information between them is nonessential and could be deleted.

### QUESTION 31

**Choice A is the best answer.** The present tense verb “swirl” is consistent with the other present tense verbs in the paragraph’s description of wet plate photographs.

Choices B, C, and D are incorrect because the tenses of these choices are inconsistent with the present tense verbs in the paragraph’s description of wet plate photographs. “Will have swirled” (choice B) is a future perfect tense verb. “Have swirled” (choice C) is a present perfect tense verb. “Swirled” (choice D) is a simple past tense verb.

### QUESTION 32

**Choice D is the best answer.** This choice is clear and concise and doesn’t unnecessarily repeat the idea that long exposure time can cause parts of a subject to disappear in a photo.

Choices A, B, and C are incorrect because they’re repetitive. The previous sentence already mentions the “long exposures,” and this noun phrase doesn’t need to be repeated.

### QUESTION 33

**Choice A is the best answer.** The reference to “nineteenth-century wave riders” accomplishes the writer’s goal of highlighting the contrast between present-day photographer Joni Sternbach’s nineteenth-century techniques and her contemporary subjects.

Choices B, C, and D are incorrect because they don’t highlight a contrast between Sternbach’s techniques and her subjects. The descriptions “ordinary people,” “surfers,” and people “from all walks of life” don’t clearly allude to the old style of her photographic techniques and, therefore, don’t offer a contrast to her subjects who wear “modern board shorts and bikinis.”

### QUESTION 34

**Choice A is the best answer.** The revision should be made because the passage is about how a team of urban archaeologists uncovered the history of New York City’s South Street Seaport, and this revision helps explain the job of urban archaeologists.

Choice B is incorrect because, although the revision should be made, it doesn’t identify the characteristics that make “cities worthy of archaeological study.” Choices C and D are incorrect because the revision should be made. Neither the kinds of artifacts that urban archaeologists find nor how excavation benefits historical study explains what urban archaeologists do.

### QUESTION 35

**Choice C is the best answer.** The singular verb “is required” agrees in number with the singular subject “project.”

Choices A, B, and D are incorrect because the plural verbs “are required,” “have been required,” and “were required” don’t agree in number with the singular subject “project.”

### QUESTION 36

**Choice D is the best answer.** This choice is clear and concise and doesn’t repeat the idea of “possibility” already mentioned in the sentence.

Choices A and B are incorrect because the words “possible” and “potentially” repeat the idea of “possibility” mentioned earlier in the sentence. Choice C is incorrect because “it is necessary that” repeats the idea mentioned later in the sentence that “an urban archaeologist must be consulted.”

### QUESTION 37

**Choice B is the best answer.** The adverb “though” correctly conveys a contrast between the facts that the work continued and the team faced obstacles.

Choices A, C, and D are incorrect because they don’t indicate the true relationship between the progression of the team’s work and the obstacles. “Therefore” suggests that because the work continued, the team faced obstacles. “Meanwhile” is redundant: the dependent clause “as the work continued” already implies that the work was happening when obstacles emerged. “Similarly” suggests that a comparison is being made.

### QUESTION 38

**Choice D is the best answer.** No punctuation is needed between the verb “halted” and the prepositional phrase “by stormy weather and the discovery of toxic materials underground” that follows it.

Choices A, B, and C are incorrect because each introduces unnecessary punctuation between the verb and the prepositional phrase.

### QUESTION 39

**Choice C is the best answer.** The noun “pedestrians” is parallel in form to the nouns “vehicles” and “car horns.”

Choices A, B, and D are incorrect because the repetition of “noise” in choices A and B and the inclusion of the pronoun “that” (which stands in for “noise”) in choice D violate the parallel structure of the series of nouns (“construction vehicles,” “car horns,” “pedestrians”) serving as the objects of the preposition “of.”

### QUESTION 40

**Choice C is the best answer.** The comma is used correctly to separate the independent clause from the participial phrase that begins with “including.”



Choice A is incorrect because the period after “site” results in a rhetorically poor fragment. Choice B is incorrect because the comma after “site” creates a comma splice. Choice D is incorrect because a semicolon can’t be used in this way to connect an independent clause to a participial phrase.

### QUESTION 41

**Choice C is the best answer.** This idea of “public utility planning and infrastructure development” best sets up the example that follows about how colonial-era New Yorkers secured fresh drinking water.

Choices A, B, and D are incorrect because they don’t set up the discussion of colonial-era New Yorkers’ public utility planning and infrastructure development. The example that follows doesn’t deal with construction materials, hospitality rituals, or the financing of construction projects.

### QUESTION 42

**Choice A is the best answer.** The word “effort” is consistent with the formal style and tone of the passage.

Choices B, C, and D are incorrect because they don’t maintain the formal style and tone of the passage. Choices B and C are colloquial, and choices B and D are exaggerations that are inconsistent with the passage’s informative style.

### QUESTION 43

**Choice D is the best answer.** The subject of the sentence, “urban archaeologists,” clearly identifies who makes discoveries and tells the story of a city’s history.

Choices A and B are incorrect because the pronouns “they” and “we” don’t have clear antecedents. Choice C is incorrect because it isn’t true. “Colonial-era New Yorkers” don’t make the discoveries or tell the stories to which the sentence refers.

### QUESTION 44

**Choice C is the best answer.** This choice accomplishes the goal of identifying the broad impact of the urban archaeological team’s work by mentioning that excavation “makes New York City’s history real.”

Choices A, B, and D are incorrect because they don’t illustrate the broad impact of the team’s work. Loorya’s references to one of her favorite things about her work (choice A), New York City construction (choice B), and the archaeological technique of monitoring (choice D) don’t provide an effective concluding statement about her team’s impact.

## Section 3: Math Test – No Calculator

### QUESTION 1

**Choice B is correct.** Multiplying both sides of the first equation in the system by 2 yields  $4x - 2y = 16$ . Adding  $4x - 2y = 16$  to the second equation in the system yields  $5x = 20$ . Dividing both sides of  $5x = 20$  by 5 yields  $x = 4$ . Substituting 4 for  $x$  in  $x + 2y = 4$  yields  $4 + 2y = 4$ . Subtracting 4 from both sides of  $4 + 2y = 4$  yields  $2y = 0$ . Dividing both sides of this equation by 2 yields  $y = 0$ . Substituting 4 for  $x$  and 0 for  $y$  in the expression  $x + y$  yields  $4 + 0 = 4$ .

Choices A, C, and D are incorrect and may result from various computation errors.

### QUESTION 2

**Choice A is correct.** Since  $(x^2 - x)$  is a common term in the original expression, like terms can be added:  $2(x^2 - x) + 3(x^2 - x) = 5(x^2 - x)$ . Distributing the constant term 5 yields  $5x^2 - 5x$ .

Choice B is incorrect and may result from not distributing the negative signs in the expressions within the parentheses. Choice C is incorrect and may result from not distributing the negative signs in the expressions within the parentheses and from incorrectly eliminating the  $x^2$ -term. Choice D is incorrect and may result from incorrectly eliminating the  $x$ -term.

### QUESTION 3

**Choice D is correct.** To find the slope and  $y$ -intercept, the given equation can be rewritten in slope-intercept form  $y = mx + b$ , where  $m$  represents the slope of the line and  $b$  represents the  $y$ -intercept. The given equation  $2y - 3x = -4$  can be rewritten in slope-intercept form by first adding  $3x$  to both sides of the equation, which yields  $2y = 3x - 4$ . Then, dividing both sides of the equation by 2 results in the equation  $y = \frac{3}{2}x - 2$ . The coefficient of  $x$ ,  $\frac{3}{2}$ , is the slope of the graph and is positive, and the constant term,  $-2$ , is the  $y$ -intercept of the graph and is negative. Thus, the graph of the equation  $2y - 3x = -4$  has a positive slope and a negative  $y$ -intercept.

Choice A is incorrect and may result from reversing the values of the slope and the  $y$ -intercept. Choices B and C are incorrect and may result from errors in calculation when determining the slope and  $y$ -intercept values.

### QUESTION 4

**Choice A is correct.** It's given that the front of the roller-coaster car starts rising when it's 15 feet above the ground. This initial height of 15 feet can be represented by a constant term, 15, in an equation. Each second, the front of the roller-coaster car rises 8 feet, which can

be represented by  $8s$ . Thus, the equation  $h = 8s + 15$  gives the height, in feet, of the front of the roller-coaster car  $s$  seconds after it starts up the hill.

Choices B and C are incorrect and may result from conceptual errors in creating a linear equation. Choice D is incorrect and may result from switching the rate at which the roller-coaster car rises with its initial height.

## QUESTION 5

**Choice C is correct.** Since the variable  $h$  represents the number of hours a job took, the coefficient of  $h$ , 75, represents the electrician's charge per hour, in dollars, after an initial fixed charge of \$125. It's given that the electrician worked 2 hours longer on Ms. Sanchez's job than on Mr. Roland's job; therefore, the additional charge for Ms. Sanchez's job is  $\$75 \times 2 = \$150$ .

Alternate approach: The amounts the electrician charged for Mr. Roland's job and Ms. Sanchez's job can be expressed in terms of  $t$ . If Mr. Roland's job took  $t$  hours, then it cost  $75t + 125$  dollars. Ms. Sanchez's job must then have taken  $t + 2$  hours, so it cost  $75(t + 2) + 125 = 75t + 275$  dollars. The difference between the two costs is  $(75t + 275) - (75t + 125) = \$150$ .

Choice A is incorrect. This is the electrician's charge per hour, not the difference between what Ms. Sanchez was charged and what Mr. Roland was charged. Choice B is incorrect. This is the fixed charge for each job, not the difference between the two. Choice D is incorrect and may result from finding the total charge for a 2-hour job.

## QUESTION 6

**Choice B is correct.** The ratio of the lengths of two arcs of a circle is equal to the ratio of the measures of the central angles that subtend the arcs. It's given that arc  $\widehat{ADC}$  is subtended by a central angle with measure  $100^\circ$ . Since the sum of the measures of the angles about a point is  $360^\circ$ , it follows that arc  $\widehat{ABC}$  is subtended by a central angle with measure  $360^\circ - 100^\circ = 260^\circ$ . If  $s$  is the length of arc  $\widehat{ABC}$ , then  $s$  must satisfy the ratio  $\frac{s}{5\pi} = \frac{260}{100}$ . Reducing the fraction  $\frac{260}{100}$  to its simplest form gives  $\frac{13}{5}$ . Therefore,  $\frac{s}{5\pi} = \frac{13}{5}$ . Multiplying both sides of  $\frac{s}{5\pi} = \frac{13}{5}$  by  $5\pi$  yields  $s = 13\pi$ .

Choice A is incorrect. This is the length of an arc consisting of exactly half of the circle, but arc  $\widehat{ABC}$  is greater than half of the circle. Choice C is incorrect. This is the total circumference of the circle. Choice D is incorrect. This is half the length of arc  $\widehat{ABC}$ , not its full length.

### QUESTION 7

**Choice D is correct.** Multiplying both sides of the given equation by  $x$  yields  $160x = 8$ . Dividing both sides of the equation  $160x = 8$  by 160 results in  $x = \frac{8}{160}$ . Reducing  $\frac{8}{160}$  to its simplest form gives  $x = \frac{1}{20}$ , or its decimal equivalent 0.05.

Choice A is incorrect and may result from multiplying, instead of dividing, the left-hand side of the given equation by 160. Choice B is incorrect and may result from a computational error. Choice C is incorrect. This is the value of  $\frac{1}{x}$ .

### QUESTION 8

**Choice C is correct.** Applying the distributive property of multiplication to the right-hand side of the given equation gives  $(3x + 15) + (5x - 5)$ , or  $8x + 10$ . An equation in the form  $cx + d = rx + s$  will have no solutions if  $c = r$  and  $d \neq s$ . Therefore, it follows that the equation  $2ax - 15 = 8x + 10$  will have no solutions if  $2a = 8$ , or  $a = 4$ .

Choice A is incorrect. If  $a = 1$ , then the given equation could be written as  $2x - 15 = 8x + 10$ . Since  $2 \neq 8$ , this equation has exactly one solution. Choice B is incorrect. If  $a = 2$ , then the given equation could be written as  $4x - 15 = 8x + 10$ . Since  $4 \neq 8$ , this equation has exactly one solution. Choice D is incorrect. If  $a = 8$ , then the given equation could be written as  $16x - 15 = 8x + 10$ . Since  $16 \neq 8$ , this equation has exactly one solution.

### QUESTION 9

**Choice B is correct.** A solution to the system of three equations is any ordered pair  $(x, y)$  that is a solution to each of the three equations. Such an ordered pair  $(x, y)$  must lie on the graph of each equation in the  $xy$ -plane; in other words, it must be a point where all three graphs intersect. The graphs of all three equations intersect at exactly one point,  $(-1, 3)$ . Therefore, the system of equations has one solution.

Choice A is incorrect. A system of equations has no solutions when there is no point at which all the graphs intersect. Because the graphs of all three equations intersect at the point  $(-1, 3)$ , there is a solution. Choice C is incorrect. The graphs of all three equations intersect at only one point,  $(-1, 3)$ . Since there is no other such point, there cannot be two solutions. Choice D is incorrect and may result from counting the number of points of intersection of the graphs of any two equations, including the point of intersection of all three equations.

### QUESTION 10

**Choice C is correct.** If the equation is true for all  $x$ , then the expressions on both sides of the equation will be equivalent. Multiplying the polynomials on the left-hand side of the equation gives  $5ax^3 - abx^2 + 4ax + 15x^2 - 3bx + 12$ . On the right-hand side of the equation, the only  $x^2$ -term is  $-9x^2$ . Since the expressions on both

sides of the equation are equivalent, it follows that  $-abx^2 + 15x^2 = -9x^2$ , which can be rewritten as  $(-ab + 15)x^2 = -9x^2$ . Therefore,  $-ab + 15 = -9$ , which gives  $ab = 24$ .

Choice A is incorrect. If  $ab = 18$ , then the coefficient of  $x^2$  on the left-hand side of the equation would be  $-18 + 15 = -3$ , which doesn't equal the coefficient of  $x^2$ ,  $-9$ , on the right-hand side. Choice B is incorrect. If  $ab = 20$ , then the coefficient of  $x^2$  on the left-hand side of the equation would be  $-20 + 15 = -5$ , which doesn't equal the coefficient of  $x^2$ ,  $-9$ , on the right-hand side. Choice D is incorrect. If  $ab = 40$ , then the coefficient of  $x^2$  on the left-hand side of the equation would be  $-40 + 15 = -25$ , which doesn't equal the coefficient of  $x^2$ ,  $-9$ , on the right-hand side.

## QUESTION 11

**Choice B is correct.** The right-hand side of the given equation,  $\frac{2x}{2}$ , can be rewritten as  $x$ . Multiplying both sides of the equation  $\frac{x}{x-3} = x$  by  $x-3$  yields  $x = x(x-3)$ . Applying the distributive property of multiplication to the right-hand side of the equation  $x = x(x-3)$  yields  $x = x^2 - 3x$ . Subtracting  $x$  from both sides of this equation yields  $0 = x^2 - 4x$ . Factoring  $x$  from both terms of  $x^2 - 4x$  yields  $0 = x(x-4)$ . By the zero product property, the solutions to the equation  $0 = x(x-4)$  are  $x = 0$  and  $x - 4 = 0$ , or  $x = 4$ . Substituting 0 and 4 for  $x$  in the given equation yields  $0 = 0$  and  $4 = 4$ , respectively. Since both are true statements, both 0 and 4 are solutions to the given equation.

Choice A is incorrect and may result from a sign error. Choice C is incorrect and may result from an error in factoring. Choice D is incorrect and may result from not considering 0 as a possible solution.

## QUESTION 12

**Choice D is correct.** The original expression can be combined into one rational expression by multiplying the numerator and denominator of the second term by the denominator of the first term:  $\frac{1}{2x+1} + 5\left(\frac{2x+1}{2x+1}\right)$ , which can be rewritten as  $\frac{1}{2x+1} + \frac{10x+5}{2x+1}$ . This expression is now the sum of two rational expressions with a common denominator, and it can be rewritten as  $\frac{1}{2x+1} + \frac{10x+5}{2x+1} = \frac{10x+6}{2x+1}$ .

Choice A is incorrect and may result from a calculation error. Choice B is incorrect and may be the result of adding the denominator of the first term to the second term rather than multiplying the first term by the numerator and denominator of the second term. Choice C is incorrect and may result from not adding the numerator of  $\frac{1}{2x+1}$  to the numerator of  $\frac{10x+5}{2x+1}$ .

## QUESTION 13

**Choice A is correct.** The equation of a parabola in vertex form is  $f(x) = a(x-h)^2 + k$ , where the point  $(h, k)$  is the vertex of the parabola and  $a$  is a constant. The graph shows that the coordinates of the vertex

are  $(3, 1)$ , so  $h = 3$  and  $k = 1$ . Therefore, an equation that defines  $f$  can be written as  $f(x) = a(x - 3)^2 + 1$ . To find  $a$ , substitute a value for  $x$  and its corresponding value for  $y$ , or  $f(x)$ . For example,  $(4, 5)$  is a point on the graph of  $f$ . So  $a$  must satisfy the equation  $5 = a(4 - 3)^2 + 1$ , which can be rewritten as  $4 = a(1)^2$ , or  $a = 4$ . An equation that defines  $f$  is therefore  $f(x) = 4(x - 3)^2 + 1$ .

Choice B is incorrect and may result from a sign error when writing the equation of the parabola in vertex form. Choice C is incorrect and may result from omitting the constant  $a$  from the vertex form of the equation of the parabola. Choice D is incorrect and may result from a sign error when writing the equation of the parabola in vertex form as well as by miscalculating the value of  $a$ .

### QUESTION 14

**Choice B is correct.** The solutions of the first inequality,  $y \geq x + 2$ , lie on or above the line  $y = x + 2$ , which is the line that passes through  $(-2, 0)$  and  $(0, 2)$ . The second inequality can be rewritten in slope-intercept form by dividing the second inequality,  $2x + 3y \leq 6$ , by 3 on both sides, which yields  $\frac{2}{3}x + y \leq 2$ , and then subtracting  $\frac{2}{3}x$  from both sides, which yields  $y \leq -\frac{2}{3}x + 2$ . The solutions to this inequality lie on or below the line  $y = -\frac{2}{3}x + 2$ , which is the line that passes through  $(0, 2)$  and  $(3, 0)$ . The only graph in which the shaded region meets these criteria is choice B.

Choice A is incorrect and may result from reversing the inequality sign in the first inequality. Choice C is incorrect and may result from reversing the inequality sign in the second inequality. Choice D is incorrect and may result from reversing the inequality signs in both inequalities.

### QUESTION 15

**Choice B is correct.** Squaring both sides of the given equation yields  $x + 2 = x^2$ . Subtracting  $x$  and 2 from both sides of  $x + 2 = x^2$  yields  $x^2 - x - 2 = 0$ . Factoring the left-hand side of this equation yields  $(x - 2)(x + 1) = 0$ . Applying the zero product property, the solutions to  $(x - 2)(x + 1) = 0$  are  $x - 2 = 0$ , or  $x = 2$  and  $x + 1 = 0$ , or  $x = -1$ . Substituting  $x = 2$  in the given equation gives  $\sqrt{4} = -2$ , which is false because  $\sqrt{4} = 2$  by the definition of a principal square root. So,  $x = 2$  isn't a solution. Substituting  $x = -1$  into the given equation gives  $\sqrt{1} = -(-1)$ , which is true because  $-(-1) = 1$ . So  $x = -1$  is the only solution.

Choices A and C are incorrect. The square root symbol represents the principal, or nonnegative, square root. Therefore, in the equation  $\sqrt{x + 2} = -x$ , the value of  $-x$  must be zero or positive. If  $x = 2$ , then  $-x = -2$ , which is negative, so 2 can't be in the set of solutions. Choice D is incorrect and may result from incorrectly reasoning that  $-x$  always has a negative value and therefore can't be equal to a value of a principal square root, which cannot be negative.



**QUESTION 16**

**The correct answer is 360.** The volume of a right rectangular prism is calculated by multiplying its dimensions: length, width, and height. Multiplying the values given for these dimensions yields a volume of  $(4)(9)(10) = 360$  cubic centimeters.

**QUESTION 17**

**The correct answer is 2.** The left-hand side of the given equation contains a common factor of 2 and can be rewritten as  $2(2x + 1)$ . Dividing both sides of this equation by 2 yields  $2x + 1 = 2$ . Therefore, the value of  $2x + 1$  is 2.

Alternate approach: Subtracting 2 from both sides of the given equation yields  $4x = 2$ . Dividing both sides of this equation by 4 yields  $x = \frac{1}{2}$ . Substituting  $\frac{1}{2}$  for  $x$  in the expression  $2x + 1$  yields  $2\left(\frac{1}{2}\right) + 1 = 2$ .

**QUESTION 18**

**The correct answer is 8.** The graph shows that the maximum value of  $f(x)$  is 2. Since  $g(x) = f(x) + 6$ , the graph of  $g$  is the graph of  $f$  shifted up by 6 units. Therefore, the maximum value of  $g(x)$  is  $2 + 6 = 8$ .

**QUESTION 19**

**The correct answer is  $\frac{3}{4}$ , or .75.** By definition of the sine ratio, since  $\sin R = \frac{4}{5}$ ,  $\frac{PQ}{PR} = \frac{4}{5}$ . Therefore, if  $PQ = 4n$ , then  $PR = 5n$ , where  $n$  is a positive constant. Then  $QR = kn$ , where  $k$  is another positive constant. Applying the Pythagorean theorem, the following relationship holds:  $(kn)^2 + (4n)^2 = (5n)^2$ , or  $k^2n^2 + 16n^2 = 25n^2$ . Subtracting  $16n^2$  from both sides of this equation yields  $k^2n^2 = 9n^2$ . Taking the square root of both sides of  $k^2n^2 = 9n^2$  yields  $kn = 3n$ . It follows that  $k = 3$ . Therefore, if  $PQ = 4n$  and  $PR = 5n$ , then  $QR = 3n$ , and by definition of the tangent ratio,  $\tan P = \frac{3n}{4n}$ , or  $\frac{3}{4}$ . Either  $3/4$  or .75 may be entered as the correct answer.

**QUESTION 20**

**The correct answer is 2.5.** The graph of the linear function  $f$  passes through the points  $(0, 3)$  and  $(1, 1)$ . The slope of the graph of the function  $f$  is therefore  $\frac{1-3}{1-0} = -2$ . It's given that the graph of the linear function  $g$  is perpendicular to the graph of the function  $f$ . Therefore, the slope of the graph of the function  $g$  is the negative reciprocal of  $-2$ , which is  $-\frac{1}{-2} = \frac{1}{2}$ , and an equation that defines the function  $g$  is  $g(x) = \frac{1}{2}x + b$ , where  $b$  is a constant. Since it's given that the graph of the function  $g$  passes through the point  $(1, 3)$ , the value of  $b$  can be found using the equation  $3 = \frac{1}{2}(1) + b$ . Solving this equation for  $b$  yields  $b = \frac{5}{2}$ , so an equation that defines the function  $g$  is  $g(x) = \frac{1}{2}x + \frac{5}{2}$ . Finding the value of  $g(0)$  by substituting 0 for  $x$  into this equation yields  $g(0) = \frac{1}{2}(0) + \frac{5}{2}$ , or  $\frac{5}{2}$ . Either 2.5 or  $5/2$  may be entered as the correct answer.

## Section 4: Math Test – Calculator

### QUESTION 1

**Choice B is correct.** Subtracting 3 from both sides of the equation yields  $3x = 24$ . Dividing both sides of this equation by 3 yields  $x = 8$ .

Choice A is incorrect and may result from finding a common factor among the three given terms instead of finding  $x$ . Choice C is incorrect and may result from incorrectly adding 3 to, instead of subtracting 3 from, the right-hand side of the equation. Choice D is incorrect. This is the value of  $3x + 3$ , not the value of  $x$ .

### QUESTION 2

**Choice D is correct.** Since 1 cubit is equivalent to 7 palms, 140 cubits are equivalent to  $140(7)$  palms, or 980 palms.

Choice A is incorrect and may result from dividing 7 by 140. Choice B is incorrect and may result from dividing 140 by 7. Choice C is incorrect. This is the length of the Great Sphinx statue in cubits, not palms.

### QUESTION 3

**Choice B is correct.** Multiplying both sides of the given equation by 5 yields  $2n = 50$ . Substituting 50 for  $2n$  in the expression  $2n - 1$  yields  $50 - 1 = 49$ .

Alternate approach: Dividing both sides of  $2n = 50$  by 2 yields  $n = 25$ . Evaluating the expression  $2n - 1$  for  $n = 25$  yields  $2(25) - 1 = 49$ .

Choice A is incorrect and may result from finding the value of  $n - 1$  instead of  $2n - 1$ . Choice C is incorrect and may result from finding the value of  $2n$  instead of  $2n - 1$ . Choice D is incorrect and may result from finding the value of  $4n - 1$  instead of  $2n - 1$ .

### QUESTION 4

**Choice A is correct.** The square root symbol represents the principal, or nonnegative, square root. Therefore, the equation  $\sqrt{x^2} = x$  is only true for values of  $x$  greater than or equal to 0. Thus,  $-4$  isn't a solution to the given equation.

Choices B, C, and D are incorrect because these values of  $x$  are solutions to the equation  $\sqrt{x^2} = x$ . Choosing one of these as a value of  $x$  that isn't a solution may result from incorrectly using the rules of exponents or incorrectly evaluating these values in the given equation.

## QUESTION 5

**Choice D is correct.** The  $x$ -axis of the graph represents the time, in minutes, after the coffee was removed from the heat source, and the  $y$ -axis of the graph represents the temperature, in degrees Fahrenheit, of the coffee. The coffee was first removed from the heat source when  $x = 0$ . The graph shows that when  $x = 0$ , the  $y$ -value was a little less than  $200^\circ\text{F}$ . Of the answer choices given, 195 is the best approximation.

Choice A is incorrect and may result from finding the temperature after 140 minutes. Choice B is incorrect and may result from finding the temperature after 50 minutes. Choice C is incorrect and may result from finding the temperature after 10 minutes.

## QUESTION 6

**Choice A is correct.** The average rate of change in temperature of the coffee in degrees Fahrenheit per minute is calculated by dividing the difference between two recorded temperatures by the number of minutes in the corresponding interval of time. Since the time intervals given are all 10 minutes, the average rate of change is greatest for the points with the greatest difference in temperature. Of the choices, the greatest difference in temperature occurs between 0 and 10 minutes.

Choices B, C, and D are incorrect and may result from misinterpreting the average rate of change from the graph.

## QUESTION 7

**Choice C is correct.** It's given that  $x = 100$ ; therefore, substituting 100 for  $x$  in triangle  $ABC$  gives two known angle measures for this triangle. The sum of the measures of the interior angles of any triangle equals  $180^\circ$ . Subtracting the two known angle measures of triangle  $ABC$  from  $180^\circ$  gives the third angle measure:  $180^\circ - 100^\circ - 20^\circ = 60^\circ$ . This is the measure of angle  $BCA$ . Since vertical angles are congruent, the measure of angle  $DCE$  is also  $60^\circ$ . Subtracting the two known angle measures of triangle  $CDE$  from  $180^\circ$  gives the third angle measure:  $180^\circ - 60^\circ - 40^\circ = 80^\circ$ . Therefore, the value of  $y$  is 80.

Choice A is incorrect and may result from a calculation error. Choice B is incorrect and may result from classifying angle  $CDE$  as a right angle. Choice D is incorrect and may result from finding the measure of angle  $BCA$  or  $DCE$  instead of the measure of angle  $CDE$ .

## QUESTION 8

**Choice A is correct.** The cost of each additional mile traveled is represented by the slope of the given line. The slope of the line can be calculated by identifying two points on the line and then calculating the ratio of the change in  $y$  to the change in  $x$  between the two points. Using the points  $(1, 5)$  and  $(2, 7)$ , the slope is equal to  $\frac{7-5}{2-1}$ , or 2. Therefore, the cost for each additional mile traveled of the cab ride is \$2.00.

Choice B is incorrect and may result from calculating the slope of the line that passes through the points (5, 13) and (0, 0). However, (0, 0) does not lie on the line shown. Choice C is incorrect. This is the y-coordinate of the y-intercept of the graph and represents the flat fee for a cab ride before the charge for any miles traveled is added. Choice D is incorrect. This value represents the total cost of a 1-mile cab ride.

### QUESTION 9

**Choice D is correct.** The total number of gas station customers on Tuesday was 135. The table shows that the number of customers who did not purchase gasoline was 50. Finding the ratio of the number of customers who did not purchase gasoline to the total number of customers gives the probability that a customer selected at random on that day did not purchase gasoline, which is  $\frac{50}{135}$ .

Choice A is incorrect and may result from finding the probability that a customer did not purchase a beverage, given that the customer did not purchase gasoline. Choice B is incorrect and may result from finding the probability that a customer did not purchase gasoline, given that the customer did not purchase a beverage. Choice C is incorrect and may result from finding the probability that a customer did purchase a beverage, given that the customer did not purchase gasoline.

### QUESTION 10

**Choice D is correct.** It is given that the number of students surveyed was 336. Finding  $\frac{1}{4}$  of 336 yields  $(\frac{1}{4})(336) = 84$ , the number of freshmen, and finding  $\frac{1}{3}$  of 336 yields  $(\frac{1}{3})(336) = 112$ , the number of sophomores. Subtracting these numbers from the total number of selected students results in  $336 - 84 - 112 = 140$ , the number of juniors and seniors combined. Finding half of this total yields  $(\frac{1}{2})(140) = 70$ , the number of juniors. Subtracting this number from the number of juniors and seniors combined yields  $140 - 70 = 70$ , the number of seniors.

Choices A and C are incorrect and may result from calculation errors. Choice B is incorrect. This is the total number of juniors and seniors.

### QUESTION 11

**Choice A is correct.** It's given that the ratio of the heights of Plant A to Plant B is 20 to 12 and that the height of Plant C is 54 centimeters. Let  $x$  be the height of Plant D. The proportion  $\frac{20}{12} = \frac{54}{x}$  can be used to solve for the value of  $x$ . Multiplying both sides of this equation by  $x$  yields  $\frac{20x}{12} = 54$  and then multiplying both sides of this equation by 12 yields  $20x = 648$ . Dividing both sides of this equation by 20 yields  $x = 32.4$  centimeters.

Choice B is incorrect and may result from a calculation error. Choice C is incorrect and may result from finding the difference in heights between Plant A and Plant B and then adding that to the height of Plant C. Choice D is incorrect and may result from using the ratio 12 to 20 rather than 20 to 12.

## QUESTION 12

**Choice D is correct.** It's given that 1 kilometer is approximately equivalent to 0.6214 miles. Let  $x$  be the number of kilometers equivalent to 3.1 miles. The proportion  $\frac{1 \text{ kilometer}}{0.6214 \text{ miles}} = \frac{x \text{ kilometers}}{3.1 \text{ miles}}$  can be used to solve for the value of  $x$ . Multiplying both sides of this equation by 3.1 yields  $\frac{3.1}{0.6214} = x$ , or  $x \approx 4.99$ . This is approximately 5 kilometers.

Choice A is incorrect and may result from misidentifying the ratio of kilometers to miles as miles to kilometers. Choice B is incorrect and may result from calculation errors. Choice C is incorrect and may result from calculation and rounding errors.

## QUESTION 13

**Choice C is correct.** Let  $a$  equal the number of 120-pound packages, and let  $b$  equal the number of 100-pound packages. It's given that the total weight of the packages can be at most 1,100 pounds: the inequality  $120a + 100b \leq 1,100$  represents this situation. It's also given that the helicopter must carry at least 10 packages: the inequality  $a + b \geq 10$  represents this situation. Values of  $a$  and  $b$  that satisfy these two inequalities represent the allowable numbers of 120-pound packages and 100-pound packages the helicopter can transport. To maximize the number of 120-pound packages,  $a$ , in the helicopter, the number of 100-pound packages,  $b$ , in the helicopter needs to be minimized. Expressing  $b$  in terms of  $a$  in the second inequality yields  $b \geq 10 - a$ , so the minimum value of  $b$  is equal to  $10 - a$ . Substituting  $10 - a$  for  $b$  in the first inequality results in  $120a + 100(10 - a) \leq 1,100$ . Using the distributive property to rewrite this inequality yields  $120a + 1,000 - 100a \leq 1,100$ , or  $20a + 1,000 \leq 1,100$ . Subtracting 1,000 from both sides of this inequality yields  $20a \leq 100$ . Dividing both sides of this inequality by 20 results in  $a \leq 5$ . This means that the maximum number of 120-pound packages that the helicopter can carry per trip is 5.

Choices A, B, and D are incorrect and may result from incorrectly creating or solving the system of inequalities.

## QUESTION 14

**Choice B is correct.** The difference between the machine's starting value and its value after 10 years can be found by subtracting \$30,000 from \$120,000:  $120,000 - 30,000 = 90,000$ . It's given that the value of the machine depreciates by the same amount each year for 10 years. Dividing \$90,000 by 10 gives \$9,000, which is the amount by which the value depreciates each year. Therefore, over a period of  $t$  years,

the value of the machine depreciates by a total of  $9,000t$  dollars. The value  $v$  of the machine, in dollars,  $t$  years after it was purchased is the starting value minus the amount of depreciation after  $t$  years, or  $v = 120,000 - 9,000t$ .

Choice A is incorrect and may result from using the value of the machine after 10 years as the machine's starting value. Choice C is incorrect. This equation shows the amount the machine's value changes each year being added to, rather than subtracted from, the starting value. Choice D is incorrect and may result from multiplying the machine's value after 10 years by  $t$  instead of multiplying the amount the machine depreciates each year by  $t$ .

### QUESTION 15

**Choice D is correct.** The slope-intercept form of a linear equation is  $y = ax + b$ , where  $a$  is the slope of the graph of the equation and  $b$  is the  $y$ -coordinate of the  $y$ -intercept of the graph. Two ordered pairs  $(x_1, y_1)$  and  $(x_2, y_2)$  can be used to compute the slope of the line with the formula  $a = \frac{y_2 - y_1}{x_2 - x_1}$ . Substituting the two ordered pairs  $(2, 4)$  and  $(0, 1)$  into this formula gives  $a = \frac{4 - 1}{2 - 0}$ , which simplifies to  $\frac{3}{2}$ . Substituting this value for  $a$  in the slope-intercept form of the equation yields  $y = \frac{3}{2}x + b$ . Substituting values from the ordered pair  $(0, 1)$  into this equation yields  $1 = \frac{3}{2}(0) + b$ , so  $b = 1$ . Substituting this value for  $b$  in the slope-intercept equation yields  $y = \frac{3}{2}x + 1$ .

Choice A is incorrect. This may result from misinterpreting the change in  $x$ -values as the slope and misinterpreting the change in  $y$ -values as the  $y$ -coordinate of the  $y$ -intercept of the graph. Choice B is incorrect and may result from using the  $x$ - and  $y$ -values of one of the given points as the slope and  $y$ -coordinate of the  $y$ -intercept, respectively. Choice C is incorrect. This equation has the correct slope but the incorrect  $y$ -coordinate of the  $y$ -intercept.

### QUESTION 16

**Choice B is correct.** Multiplying the binomials in the given expression results in  $4ax^2 + 4ax - 4x - 4 - x^2 + 4$ . Combining like terms yields  $4ax^2 + 4ax - 4 - x^2$ . Grouping by powers of  $x$  and factoring out their greatest common factors yields  $(4a - 1)x^2 + (4a - 4)x$ . It's given that this expression is equivalent to  $bx$ , so  $(4a - 1)x^2 + (4a - 4)x = bx$ . Since the right-hand side of the equation has no  $x^2$  term, the coefficient of the  $x^2$  term on the left-hand side must be 0. This gives  $4a - 1 = 0$  and  $4a - 4 = b$ . Since  $4a - 1 = 0$ ,  $4a = 1$ . Substituting the value of  $4a$  into the second equation gives  $1 - 4 = b$ , so  $b = -3$ .

Choices A, C, and D are incorrect and may result from a calculation error.



### QUESTION 17

**Choice C is correct.** Multiplying both sides of  $2w + 4t = 14$  by 2 yields  $4w + 8t = 28$ . Subtracting the second given equation from  $4w + 8t = 28$  yields  $(4w - 4w) + (8t - 5t) = (28 - 25)$  or  $3t = 3$ . Dividing both sides of this equation by 3 yields  $t = 1$ . Substituting 1 for  $t$  in the equation  $2w + 4t = 14$  yields  $2w + 4(1) = 14$ , or  $2w + 4 = 14$ . Subtracting 4 from both sides of this equation yields  $2w = 10$ , and dividing both sides of this equation by 2 yields  $w = 5$ . Substituting 5 for  $w$  and 1 for  $t$  in the expression  $2w + 3t$  yields  $2(5) + 3(1) = 13$ .

Choices A, B, and D are incorrect and may result from incorrectly calculating the values of  $w$  and  $t$ , or from correctly calculating the values of  $w$  and  $t$  but finding the value of an expression other than  $2w + 3t$ . For instance, choice A is the value of  $w + t$ , choice B is the value of  $2w$ , and choice D is the value of  $2t + 3w$ .

### QUESTION 18

**Choice B is correct.** It's given that each serving of Crunchy Grain cereal provides 5% of an adult's daily allowance of potassium, so  $x$  servings would provide  $x$  times 5%. The percentage of an adult's daily allowance of potassium,  $p$ , is 5 times the number of servings,  $x$ . Therefore, the percentage of an adult's daily allowance of potassium can be expressed as  $p = 5x$ .

Choices A, C, and D are incorrect and may result from incorrectly converting 5% to its decimal equivalent, which isn't necessary since  $p$  is expressed as a percentage. Additionally, choices C and D are incorrect because the context should be represented by a linear relationship, not by an exponential relationship.

### QUESTION 19

**Choice B is correct.** It's given that a  $\frac{3}{4}$ -cup serving of Crunchy Grain cereal provides 210 calories. The total number of calories per cup can be found by dividing 210 by  $\frac{3}{4}$ , which gives  $210 \div \frac{3}{4} = 280$  calories per cup. Let  $c$  be the number of cups of Crunchy Grain cereal and  $s$  be the number of cups of Super Grain cereal. The expression  $280c$  represents the number of calories in  $c$  cups of Crunchy Grain cereal, and  $240s$  represents the number of calories in  $s$  cups of Super Grain cereal. The equation  $280c + 240s = 270$  gives the total number of calories in one cup of the mixture. Since  $c + s = 1$  cup,  $c = 1 - s$ . Substituting  $1 - s$  for  $c$  in the equation  $280c + 240s = 270$  yields  $280(1 - s) + 240s = 270$ , or  $280 - 280s + 240s = 270$ . Simplifying this equation yields  $280 - 40s = 270$ . Subtracting 280 from both sides results in  $-40s = -10$ . Dividing both sides of the equation by  $-40$  results in  $s = \frac{1}{4}$ , so there is  $\frac{1}{4}$  cup of Super Grain cereal in one cup of the mixture.

Choices A, C, and D are incorrect and may result from incorrectly creating or solving the system of equations.

## QUESTION 20

**Choice A is correct.** There are 0 calories in 0 servings of Crunchy Grain cereal so the line must begin at the point (0, 0). Point (0, 0) is the origin, labeled *O*. Additionally, each serving increases the calories by 250. Therefore, the number of calories increases as the number of servings increases, so the line must have a positive slope. Of the choices, only choice A shows a graph with a line that begins at the origin and has a positive slope.

Choices B, C, and D are incorrect. These graphs don't show a line that passes through the origin. Additionally, choices C and D may result from misidentifying the slope of the graph.

## QUESTION 21

**Choice D is correct.** Since the function  $h$  is exponential, it can be written as  $h(x) = ab^x$ , where  $a$  is the  $y$ -coordinate of the  $y$ -intercept and  $b$  is the growth rate. Since it's given that the  $y$ -coordinate of the  $y$ -intercept is  $d$ , the exponential function can be written as  $h(x) = db^x$ . These conditions are only met by the equation in choice D.

Choice A is incorrect. For this function, the value of  $h(x)$  when  $x = 0$  is  $-3$ , not  $d$ . Choice B is incorrect. This function is a linear function, not an exponential function. Choice C is incorrect. This function is a polynomial function, not an exponential function.

## QUESTION 22

**Choice B is correct.** The median weight is found by ordering the horses' weights from least to greatest and then determining the middle value from this list of weights. Decreasing the value for the horse with the lowest weight doesn't affect the median since it's still the lowest value.

Choice A is incorrect. The mean is calculated by finding the sum of all the weights of the horses and then dividing by the number of horses. Decreasing one of the weights would decrease the sum and therefore decrease the mean. Choice C is incorrect. Range is the difference between the highest and lowest weights, so decreasing the lowest weight would increase the range. Choice D is incorrect. Standard deviation is calculated based on the mean weight of the horses. Decreasing one of the weights decreases the mean and therefore would affect the standard deviation.

## QUESTION 23

**Choice B is correct.** In order for the poll results from a sample of a population to represent the entire population, the sample must be representative of the population. A sample that is randomly selected from a population is more likely than a sample of the type described to represent the population. In this case, the people who responded were people with access to cable television and websites,

which aren't accessible to the entire population. Moreover, the people who responded also chose to watch the show and respond to the poll. The people who made these choices aren't representative of the entire population of the United States because they were not a random sample of the population of the United States.

Choices A, C, and D are incorrect because they present reasons unrelated to whether the sample is representative of the population of the United States.

## QUESTION 24

**Choice C is correct.** Substituting  $x + a$  for  $x$  in  $f(x) = 5x^2 - 3$  yields  $f(x + a) = 5(x + a)^2 - 3$ . Expanding the expression  $5(x + a)^2$  by multiplication yields  $5x^2 + 10ax + 5a^2$ , and thus  $f(x + a) = 5x^2 + 10ax + 5a^2 - 3$ . Setting the expression on the right-hand side of this equation equal to the given expression for  $f(x + a)$  yields  $5x^2 + 30x + 42 = 5x^2 + 10ax + 5a^2 - 3$ . Because this equality must be true for all values of  $x$ , the coefficients of each power of  $x$  are equal. Setting the coefficients of  $x$  equal to each other gives  $10a = 30$ . Dividing each side of this equation by 10 yields  $a = 3$ .

Choices A, B, and D are incorrect and may result from a calculation error.

## QUESTION 25

**Choice C is correct.** The sine of an angle is equal to the cosine of the angle's complement. This relationship can be expressed by the equation  $\sin x^\circ = \cos(90^\circ - x^\circ)$ . Therefore, if  $\sin x^\circ = a$ , then  $\cos(90^\circ - x^\circ)$  must also be equal to  $a$ .

Choices A and B are incorrect and may result from misunderstanding the relationship between the sine and cosine of complementary angles. Choice D is incorrect and may result from misinterpreting  $\sin(x^2)^\circ$  as  $\sin^2(x)^\circ$ .

## QUESTION 26

**Choice D is correct.** The positive  $x$ -intercept of the graph of  $y = h(x)$  is a point  $(x, y)$  for which  $y = 0$ . Since  $y = h(x)$  models the height above the ground, in feet, of the projectile, a  $y$ -value of 0 must correspond to the height of the projectile when it is 0 feet above ground or, in other words, when the projectile is on the ground. Since  $x$  represents the time since the projectile was launched, it follows that the positive  $x$ -intercept,  $(x, 0)$ , represents the time at which the projectile hits the ground.

Choice A is incorrect and may result from misidentifying the  $y$ -intercept as a positive  $x$ -intercept. Choice B is incorrect and may result from misidentifying the  $y$ -value of the vertex of the graph of the function as an  $x$ -intercept. Choice C is incorrect and may result from misidentifying the  $x$ -value of the vertex of the graph of the function as an  $x$ -intercept.

### QUESTION 27

**Choice A is correct.** Since  $(a, 0)$  and  $(b, 0)$  are the only two points where the graph of  $f$  crosses the  $x$ -axis, it must be true that  $f(a) = 0$  and  $f(b) = 0$  and that  $f(x)$  is not equal to 0 for any other value of  $x$ . Of the given choices, choice A is the only function for which this is true. If  $f(x) = (x - a)(x - b)$ , then  $f(a) = (a - a)(a - b)$ , which can be rewritten as  $f(a) = 0(a - b)$ , or  $f(a) = 0$ . Also,  $f(b) = (b - a)(b - b)$ , which can be rewritten as  $f(b) = (b - a)(0)$ , or  $f(b) = 0$ . Furthermore, if  $f(x) = (x - a)(x - b)$  is equal to 0, then it follows that either  $x - a = 0$  or  $x - b = 0$ . Solving each of these equations by adding  $a$  to both sides of the first equation and adding  $b$  to both sides of the second equation yields  $x = a$  or  $x = b$ . Therefore, the graph of  $f(x) = (x - a)(x - b)$  crosses the  $x$ -axis at exactly two points,  $(a, 0)$  and  $(b, 0)$ .

Choice B is incorrect because  $f(a) = (2a)(a + b)$ , which can't be 0 because it's given that  $a$  and  $b$  are positive. Choice C is incorrect because  $f(b) = (b - a)(2b)$ ; its graph could only be 0 if  $b = a$ , but it would cross the  $x$ -axis at only one point, since  $(a, 0)$  and  $(b, 0)$  would be the same point. Choice D is incorrect because its graph crosses the  $x$ -axis at  $(0, 0)$  as well as at  $(a, 0)$  and  $(b, 0)$ .

### QUESTION 28

**Choice C is correct.** Substituting 0 for  $x$  in the given equation yields  $3(0)^2 + 6(0) + 2 = 2$ . Therefore, the graph of the given equation passes through the point  $(0, 2)$ , which is the  $y$ -intercept of the graph. The right-hand side of the given equation,  $y = 3x^2 + 6x + 2$ , displays the constant 2, which directly corresponds to the  $y$ -coordinate of the  $y$ -intercept of the graph of this equation in the  $xy$ -plane.

Choice A is incorrect. The  $y$ -coordinate of the vertex of the graph is  $-1$ , not 3, 6, or 2. Choice B is incorrect. The  $x$ -coordinates of the  $x$ -intercepts of the graph are at approximately  $-1.577$  and  $-0.423$ , not 3, 6, or 2. Choice D is incorrect. The  $x$ -coordinate of the  $x$ -intercept of the line of symmetry is at  $-1$ , not 3, 6, or 2.

### QUESTION 29

**Choice A is correct.** The given equation is in slope-intercept form, or  $y = mx + b$ , where  $m$  is the value of the slope of the line of best fit. Therefore, the slope of the line of best fit is 0.096. From the definition of slope, it follows that an increase of 1 in the  $x$ -value corresponds to an increase of 0.096 in the  $y$ -value. Therefore, the line of best fit predicts that for each year between 1940 and 2010, the minimum wage will increase by 0.096 dollar per hour.

Choice B is incorrect and may result from using the  $y$ -coordinate of the  $y$ -intercept as the average increase, instead of the slope. Choice C is incorrect and may result from using the 10-year increments given on the  $x$ -axis to incorrectly interpret the slope of the line of best fit. Choice D is incorrect and may result from using the  $y$ -coordinate

of the  $y$ -intercept as the average increase, instead of the slope, and from using the 10-year increments given on the  $x$ -axis to incorrectly interpret the slope of the line of best fit.

### QUESTION 30

**Choice D is correct.** On the line of best fit,  $d$  increases from approximately 480 to 880 between  $t = 12$  and  $t = 24$ . The slope of the line of best fit is the difference in  $d$ -values divided by the difference in  $t$ -values, which gives  $\frac{880 - 480}{24 - 12} = \frac{400}{12}$ , or approximately 33. Writing the equation of the line of best fit in slope-intercept form gives  $d = 33t + b$ , where  $b$  is the  $y$ -coordinate of the  $y$ -intercept. This equation is satisfied by all points on the line, so  $d = 480$  when  $t = 12$ . Thus,  $480 = 33(12) + b$ , which is equivalent to  $480 = 396 + b$ . Subtracting 396 from both sides of this equation gives  $b = 84$ . Therefore, an equation for the line of best fit could be  $d = 33t + 84$ .

Choice A is incorrect and may result from an error in calculating the slope and misidentifying the  $y$ -coordinate of the  $y$ -intercept of the graph as the value of  $d$  at  $t = 10$  rather than the value of  $d$  at  $t = 0$ . Choice B is incorrect and may result from using the smallest value of  $t$  on the graph as the slope and misidentifying the  $y$ -coordinate of the  $y$ -intercept of the graph as the value of  $d$  at  $t = 10$  rather than the value of  $d$  at  $t = 0$ . Choice C is incorrect and may result from misidentifying the  $y$ -coordinate of the  $y$ -intercept as the smallest value of  $d$  on the graph.

### QUESTION 31

**The correct answer is 6.** Circles are symmetric with respect to any given diameter through the center  $(h, k)$ . One diameter of the circle is perpendicular to the  $x$ -axis. Therefore, the value of  $h$  is the mean of the  $x$ -coordinates of the circle's two  $x$ -intercepts:  $h = \frac{20 + 4}{2} = 12$ .

The radius of the circle is given as 10, so the point  $(h, k)$  must be a distance of 10 units from any point on the circle. The equation of any circle can be written as  $(x - h)^2 + (y - k)^2 = r^2$ , where  $(h, k)$  is the center of the circle and  $r$  is the length of the radius of the circle. Substituting 12 for  $h$  and 10 for  $r$  into this equation gives  $(x - 12)^2 + (y - k)^2 = 10^2$ . Substituting the  $x$ -coordinate and  $y$ -coordinate of a point on the circle,  $(4, 0)$ , gives  $(4 - 12)^2 + (0 - k)^2 = 10^2$ , or  $64 + k^2 = 100$ . Subtracting 64 from both sides of this equation yields  $k^2 = 36$ . Therefore,  $k = \pm\sqrt{36}$ . Since the graph shows the point  $(h, k)$  in the first quadrant,  $k$  must be the positive square root of 36, so  $k = 6$ .

### QUESTION 32

**The correct answer is 2.** It's given that line  $\ell$  is perpendicular to the line with equation  $y = -\frac{2}{3}x$ . Since the equation  $y = -\frac{2}{3}x$  is written in slope-intercept form, the slope of the line is  $-\frac{2}{3}$ . The slope of line  $\ell$  must be the negative reciprocal of  $-\frac{2}{3}$ , which is  $\frac{3}{2}$ . It's also given that

the  $y$ -coordinate of the  $y$ -intercept of line  $\ell$  is  $-13$ , so the equation of line  $\ell$  in slope-intercept form is  $y = \frac{3}{2}x - 13$ . If  $y = b$  when  $x = 10$ ,  $b = \frac{3}{2}(10) - 13$ , which is equivalent to  $b = 15 - 13$ , or  $b = 2$ .

### QUESTION 33

**The correct answer is 8.** In this group,  $\frac{1}{9}$ th of the people who are rhesus negative have blood type B. The total number of people who are rhesus negative in the group is  $7 + 2 + 1 + x$ , and there are 2 people who are rhesus negative with blood type B. Therefore,  $\frac{2}{(7 + 2 + 1 + x)} = \frac{1}{9}$ . Combining like terms on the left-hand side of the equation yields  $\frac{2}{(10 + x)} = \frac{1}{9}$ . Multiplying both sides of this equation by 9 yields  $\frac{18}{(10 + x)} = 1$ , and multiplying both sides of this equation by  $(10 + x)$  yields  $18 = 10 + x$ . Subtracting 10 from both sides of this equation yields  $8 = x$ .

### QUESTION 34

**The correct answer is 9.** The median number of goals scored is found by ordering the number of goals scored from least to greatest and then determining the middle value in the list. If the number of goals scored in each of the 29 games were listed in order from least to greatest, the median would be the fifteenth number of goals. The graph shows there were 8 games with 1 goal scored and 9 games with 2 goals scored. Therefore, the fifteenth number, or the median number, of goals scored must be 2. According to the graph, the soccer team scored 2 goals in 9 of the games played.

### QUESTION 35

**The correct answer is 15.** It's given that the deductions reduce the original amount of taxes owed by \$2,325.00. Since the deductions reduce the original amount of taxes owed by  $d\%$ , the equation  $\frac{2,325}{15,500} = \frac{d}{100}$  can be used to find this percent decrease,  $d$ . Multiplying both sides of this equation by 100 yields  $\frac{232,500}{15,500} = d$ , or  $15 = d$ . Thus, the tax deductions reduce the original amount of taxes owed by 15%.

### QUESTION 36

**The correct answer is 1.5.** It's given that the system of linear equations has no solutions. Therefore, the lines represented by the two equations are parallel. Each of the equations can be written in slope-intercept form, or  $y = mx + b$ , where  $m$  is the slope of the line and  $b$  is the  $y$ -coordinate of the line's  $y$ -intercept. Subtracting  $\frac{3}{4}x$  from both sides of  $\frac{3}{4}x - \frac{1}{2}y = 12$  yields  $-\frac{1}{2}y = -\frac{3}{4}x + 12$ . Dividing both sides of



this equation by  $-\frac{1}{2}$  yields  $y = \frac{-3}{-\frac{1}{2}}x + \frac{12}{-\frac{1}{2}}$ , or  $y = \frac{3}{2}x - 24$ . Therefore, the

slope of the line represented by the first equation in the system is  $\frac{3}{2}$ .

The second equation in the system can be put into slope-intercept form by first subtracting  $ax$  from both sides of  $ax - by = 9$ , then dividing

both sides of the equation by  $-b$ , which yields  $y = \frac{a}{b}x - \frac{9}{b}$ . Therefore, the slope of the line represented by the second equation in the system

is  $\frac{a}{b}$ . Parallel lines have equal slopes. Therefore,  $\frac{a}{b} = \frac{3}{2}$ . Either  $3/2$  or  $1.5$  may be entered as the correct answer.

### QUESTION 37

**The correct answer is 1.3.** The median number of tourists is found by ordering the number of tourists from least to greatest and determining the middle value from this list. When the number of tourists in 2012 is ordered from least to greatest, the middle value, or the fifth number, is 46.4 million. When the number of tourists in 2013 is ordered from least to greatest, the middle value, or the fifth number, is 47.7 million. The difference between these two medians is  $47.7 \text{ million} - 46.4 \text{ million} = 1.3 \text{ million}$ .

### QUESTION 38

**The correct answer is 3.** Let  $y$  be the number of international tourist arrivals in Russia in 2012, and let  $x$  be the number of these arrivals in 2011. It's given that  $y$  is 13.5% greater than  $x$ , or  $y = 1.135x$ . The table gives that  $y = 24.7$ , so  $24.7 = 1.135x$ . Dividing both sides of this equation by 1.135 yields  $\frac{24.7}{1.135} = x$ , or  $x \approx 21.8$  million arrivals. The difference in the number of tourist arrivals between these two years is  $24.7 \text{ million} - 21.8 \text{ million} = 2.9 \text{ million}$ . Therefore, the value of  $k$  is 3 when rounded to the nearest integer.

THIS PAGE IS INTENTIONALLY LEFT BLANK.