

# The SAT<sup>®</sup>

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# Practice Test #4

## ANSWER EXPLANATIONS

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

# Reading and Writing

## Module 1

(33 questions)

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### QUESTION 1

**Choice B** is the best answer because it most logically completes the text's discussion of the OSIRIS-REx spacecraft's contact with the asteroid 101955 Bennu. In this context, "collected" means acquired and took away. The text indicates that although the boulders on the asteroid's surface caused some unforeseen problems, OSIRIS-REx was able to gather a sample to return to Earth. This context suggests that OSIRIS-REx successfully collected a sample of 101955 Bennu.

*Choice A* is incorrect because in this context "attached" means connected or affixed. The text indicates that OSIRIS-REx gathered pieces of 101955 Bennu to bring to Earth; it doesn't suggest that the spacecraft attached anything to the asteroid. *Choice C* is incorrect because in this context "followed" means tracked or traveled behind and the text discusses OSIRIS-REx's brief encounter with 101955 Bennu during which the spacecraft gathered a sample to bring to Earth. The text doesn't suggest that the spacecraft tracked the sample, and it's not clear what it would mean for the spacecraft to travel behind the sample it collected.

*Choice D* is incorrect because in this context "replaced" means put back or returned. The text indicates that OSIRIS-REx gathered pieces of 101955 Bennu to bring to Earth but doesn't suggest that anything was returned to the asteroid.

## QUESTION 2

**Choice A** is the best answer because it most logically completes the text's discussion of the Moon's surface. In this context, "reflect" means show or make apparent. The text states that because the surface of the Moon was softer when the Moon was still forming than it is now, early asteroid and meteoroid impacts "would have left less of an impression" and, as a result, evidence of them may no longer exist. This context supports the idea that the surface of the Moon may not accurately show signs of early impact events.

**Choice B** is incorrect because it wouldn't make sense to say that the surface of the Moon may not accurately "receive," or acquire or experience, early impacts from asteroids or meteoroids. The text indicates that the impacts have already occurred, and it isn't clear how the Moon's surface could be accurate or inaccurate in experiencing them. **Choice C** is incorrect because it wouldn't make sense to say that the surface of the Moon may not accurately "evaluate," or determine the significance or condition of, early impacts from asteroids or meteoroids, since that would suggest that it's possible for the Moon's surface to make a decision of any kind. **Choice D** is incorrect. In this context, "mimic" would mean to deliberately simulate or closely imitate something. It wouldn't make sense to say that the surface of the Moon may not accurately mimic early asteroid and meteoroid impacts, since that would suggest that it's possible for the Moon to deliberately imitate something.

## QUESTION 3

**Choice A** is the best answer because it most logically completes the text's discussion about handedness in animals. As used in this context, "recognizable" means apparent or identifiable. The text indicates that handedness is "easy to observe in humans," but that animal-behavior researchers use special tasks to determine handedness in other animals. This context and the use of "less" before the blank indicate that compared with handedness in humans, handedness in other animals is less recognizable.

**Choice B** is incorrect because there's nothing in the text to suggest that handedness is less "intriguing," or fascinating, in nonhuman animals than it is in humans. The text focuses on how easy it is to observe handedness in humans as compared with other animals; the text doesn't suggest that handedness is more fascinating in humans. **Choice C** is incorrect because there's nothing in the text to suggest that handedness is less "significant," or important or meaningful, in nonhuman animals than it is in humans. The text focuses on how easy it is to observe handedness in humans as compared with other animals; the text doesn't suggest that handedness is more significant in humans. **Choice D** is incorrect because "useful," or functional or helpful, wouldn't make sense in context. The text focuses on the ease with which researchers can determine whether an animal or person is right- or left-handed, not on how useful handedness in nonhuman animals is compared with handedness in humans.

## QUESTION 4

**Choice C** is the best answer because it most logically completes the text's discussion of the influences on Banisadr's work. As used in this context, "unimportant" means trivial or lacking value. "It is by no means" establishes that the word that goes in the blank is contradicted by other information; the material that follows "indeed" later in that sentence provides the contradicting information—namely, that Banisadr himself cites Bosch as an inspiration. In other words, the sentence indicates that Bosch's influence on Banisadr is significant, and thus recognizing that influence is by no means unimportant.

*Choice A* is incorrect because it wouldn't make sense to say that recognizing Bosch's influence on Banisadr isn't "substantial," or meaningful. The text states that Banisadr himself cites Bosch as an influence. *Choice B* is incorrect because it wouldn't make sense to say that it isn't "satisfying," or pleasing, to recognize Bosch's influence on Banisadr. The text states that Banisadr himself cites Bosch as an influence. *Choice D* is incorrect because it wouldn't make sense to say that recognizing Bosch's influence on Banisadr isn't "appropriate," or suitable. The text indicates that Banisadr himself notes that Bosch's work has had an effect on him.

## QUESTION 5

**Choice A** is the best answer because it most accurately describes the main purpose of the text. The text begins by stating that the new picture "failed to fit in" with the other items that the shop owner has. The text goes on to illustrate that point by describing the other pictures the shop owner has, indicating that the shop owner is fuming because he doesn't think the new picture belongs in the store. In the second paragraph, however, the text indicates that the shop owner is "secretly proud of his acquisition." The main purpose of the text is thus to reveal the shop owner's conflicted feelings about the new picture.

*Choice B* is incorrect because the text doesn't suggest that the shop owner resents the young man who sold him the new picture; in fact, the text gives no indication of the owner's feelings about the young man at all. *Choice C* is incorrect. Although the text indicates that the new picture is different from the other items in the shop, there's no suggestion that the shop owner prizes either the new picture or the pictures of the city, pets, and landscapes more than he prizes any other items. *Choice D* is incorrect because the text doesn't describe what the new picture looks like; rather, the text identifies some of the other kinds of images that the shop owner has and states that they're different from the new picture without explaining how they're different.

## QUESTION 6

**Choice B** is the best answer because it most accurately describes the overall structure of the text. First, the speaker describes observing a “most beautiful” sight: a tree (“black cypress”) standing out from the golden sky behind it, looking like a person’s finger “pointing upwards” and appearing “sensitive” and “exquisite.” Then the speaker wonders about the image’s meaning, asking why the finger is black and why it’s pointing upward. Thus, the text moves from the speaker’s description of a distinctive sight in nature to her pondering about what meaning to attribute to that sight.

**Choice A** is incorrect because the speaker assesses a natural sight—a “black cypress” tree standing “against a gold, gold sky” like a pointed finger—but doesn’t question the accuracy of her own assessment. Although she wonders why the finger, which is really a tree, is black and why it’s pointing, the speaker doesn’t suggest that her belief that the tree resembles a finger is wrong. **Choice C** is incorrect. Although the speaker describes seeing a “black cypress” tree standing “against a gold, gold sky” like a pointed finger, she wonders about that natural image (asking why the finger, which is really a tree, is black and why it’s pointing) and doesn’t give any indication that any people are present in the scene. **Choice D** is incorrect. Although the speaker examines and wonders about one thing in her surroundings—a “black cypress” tree standing “against a gold, gold sky” like a pointed finger—she doesn’t address her own emotional state or consider how it’s affected by her surroundings.

## QUESTION 7

**Choice D** is the best answer because it best describes the overall structure of the text. The speaker begins by stating that he has heard that others are accusing him of seeking to destroy institutions. The speaker then addresses this criticism by stating that he is “neither for nor against institutions.” Instead, the speaker states that his ultimate goal is to instill “the institution of the dear love of comrades” everywhere in the country. Therefore, the overall structure of the text is best described as an address of criticism followed by an announcement of a grand ambition.

**Choice A** is incorrect. While the speaker does address an opinion of him that he believes to be untrue, he doesn’t indicate that this attitude has become increasingly prevalent. The speaker also concludes by explaining his goal for the future rather than his current worldview. **Choice B** is incorrect because the text doesn’t portray the speaker as isolated or regretful, and the speaker gestures toward a hope for societal change but doesn’t offer an explicit prediction that it will happen. **Choice C** is incorrect because the speaker addresses a criticism of him that he believes to be false; he doesn’t admit any personal shortcomings. Moreover, the speaker concludes by stating a goal he has rather than showcasing his achievements.

## QUESTION 8

**Choice B** is the best answer because it most accurately describes the function of the third sentence within the overall structure of the text. The third sentence makes a generalization, asserting that evolutionary links between predators and prey can persist across great expanses of time and distance. This generalization is exemplified by the text's discussion of the relationship between mimosa trees and *B. terrenus* beetles. When mimosa trees were introduced to North America in 1785, no *B. terrenus* beetles were present, so the relationship between the trees and the beetles that exists in their native East Asia was disrupted. When the beetles were introduced to North America more than 200 years later, however, they quickly attacked mimosa trees, illustrating the generalization that links between predators and prey "can persist across centuries and continents."

**Choice A** is incorrect because the third sentence doesn't indicate that Chang and colleagues were investigating any particular hypothesis. According to the text, Chang and colleagues were simply monitoring mimosa trees when the beetles happened to be introduced to the area. **Choice C** is incorrect because the third sentence offers a generalization about the relationship between predators and prey, not an explanation for the findings of Chang and colleagues that differs from an explanation presented elsewhere in the text. **Choice D** is incorrect because the third sentence doesn't discuss any particular species (either the species mentioned elsewhere in the text or any other) and doesn't help explain why species spread to new locations.

## QUESTION 9

**Choice B** is the best answer because it describes the most likely way that Graeber and Wengrow (Text 2) would respond to the "conventional wisdom" presented in Text 1. According to Text 1, the conventional wisdom about human social systems is that they developed through stages, beginning with hunter-gatherer bands, then moving to clan associations, then chiefdoms, and finally arriving at states with bureaucratic structures. Text 2 indicates that Graeber and Wengrow believe that human social systems have been flexible, shifting between different types of structures, including both hierarchical and collective systems, and that these shifts may have even occurred seasonally. This suggests that Graeber and Wengrow would dispute the idea that developments in social structures have followed a linear progression through distinct stages.

**Choice A** is incorrect because nothing in Text 2 suggests that Graeber and Wengrow believe that decentralized collective societies are more significant than hierarchical systems. Text 2 is focused on Graeber and Wengrow's view that humans have flexibly shifted among various social structures, not on the importance of particular structures relative to others. **Choice C** is incorrect because Text 2 doesn't include any information suggesting that Graeber and Wengrow believe that hierarchies didn't emerge until after the rise of agriculture. In fact, Text 2 indicates that Graeber and Wengrow cite evidence suggesting that some hunter-gatherer groups formed social structures with hierarchical elements ("communities that included esteemed individuals") 50,000 years ago, long before the rise of agriculture, which Text 1 says occurred around 12,000 years ago.

*Choice D* is incorrect because there's no information in Text 2 suggesting that Graeber and Wengrow would challenge the assumption that groupings of hunter-gatherers were among the earliest forms of social structure. Although Text 1 does indicate that hunter-gatherer groups are assumed to be the earliest human social system, Text 2 says only that Graeber and Wengrow believe that some hunter-gatherer groups made use of different social structures at different times. Text 2 doesn't imply that Graeber and Wengrow doubt that hunter-gatherer groups preceded most other social structures.

## QUESTION 10

**Choice D** is the best answer because it most accurately states the main idea of the text. The text describes Mary's activities in an overgrown hidden garden, saying that she was "very much absorbed" and was "only becoming more pleased with her work every hour" rather than getting tired of it. She also thinks of garden activities as a "fascinating sort of play." Thus, the main idea of the text is that Mary feels very satisfied when taking care of the garden.

*Choice A* is incorrect because the text never makes any mention of Mary's chores. *Choice B* is incorrect because the text indicates that Mary finds pulling up weeds to be fascinating, not boring. *Choice C* is incorrect because Mary thinks of garden activities in and of themselves as play, not as something necessary to do to create a space to play.

## QUESTION 11

**Choice C** is the best answer because it presents a description of how the human mind is like a flower that is directly supported by the text. The text compares the needs of a "fragile and lovely flower" to those of the speaker's "tender mind": both need to be fed if they're going to survive. Without such feeding, they'll "beginne[n]t straightway to languish," or weaken. Thus, the text suggests that the human mind is like a flower in that they both need proper nourishment in order to thrive.

*Choice A* is incorrect because the text doesn't address the passage of time or describe either the human mind or a flower as becoming increasingly vigorous. *Choice B* is incorrect because the text doesn't suggest that human minds or flowers draw strength from changes in weather. The references to rain in the text pertain to a flower's need for water rather than the general effects of changing weather. *Choice D* is incorrect because the text doesn't suggest that the human mind or a flower will persist regardless of challenging circumstances. In fact, the text indicates that they'll both languish right away if not given what they need.

## QUESTION 12

**Choice D** is the best answer because it most accurately states the main idea of the text. After establishing that Buck views most people “as nothing,” the text explains that Buck won’t acknowledge people other than Thornton unless they appear friendly toward Thornton, and even then he’s only reluctantly accepting. Thus, the text focuses on the idea that Thornton has a special status in Buck’s mind, with Buck holding him in higher regard than other people.

*Choice A* is incorrect because the text conveys that Buck isn’t social with people other than Thornton but doesn’t address Buck’s life or temperament before he lived with Thornton. *Choice B* is incorrect because the text conveys that Buck doesn’t really care about people other than Thornton and is aloof toward them. However, there’s no indication that Buck mistrusts and avoids people generally; indeed, he accepts Thornton, who is a human. *Choice C* is incorrect because the text refers to random travelers praising and petting Buck and Thornton’s partners giving Buck favors, but there’s no indication that any of these people are Thornton’s friends or that they have a particular fondness for Buck.

## QUESTION 13

**Choice A** is the best answer because it uses data from the graph to accurately complete the text. The graph shows the number of organic farms located in each of six US states in 2016: between 2,600 and 2,800 in California; between 1,200 and 1,400 in Wisconsin; between 1,000 and 1,200 in New York; approximately 800 in Pennsylvania; and between 600 and 800 in both Iowa and Washington. The last sentence of the text provides information about the number of organic farms in 2016, first describing the number in California. The best completion of the sentence is the choice that accurately describes the number of organic farms in 2016 in another state, which the assertion that Washington had between 600 and 800 organic farms provides.

*Choice B* is incorrect because it doesn’t accurately reflect the data from the graph. The graph indicates that there were between 1,000 and 1,200 organic farms in New York, not fewer than 800 organic farms. *Choice C* is incorrect because it doesn’t accurately reflect the data from the graph. While the graph indicates that there were between 1,200 and 1,400 organic farms in Wisconsin in 2016, there were only between 600 and 800 in Iowa. *Choice D* is incorrect because it doesn’t accurately reflect the data from the graph. The graph indicates that in 2016 there were approximately 800 organic farms in Pennsylvania, not more than 1,200.



**QUESTION 14**

**Choice B** is the best answer because it presents a finding that, if true, would most directly support Gómez-Bahamón and her team's hypothesis about fork-tailed flycatchers. The text indicates that although two subspecies of the birds live in the same region, the tail feathers of the migrating males make a higher-pitched sound than the tail feathers of the nonmigrating males do. Gómez-Bahamón and her team hypothesize that female fork-tailed flycatchers are attracted to the particular sound made by the tail feathers of males of their own subspecies, which will bring about additional "genetic and anatomical divergence" between the two subspecies. If it were found that the pitch generated by the tail feathers of migrating males is getting higher over successive generations, it would indicate that the shape of the migrating subspecies' tail feathers is diverging further from that of the nonmigrating subspecies. And if females continue to prefer the sounds of the males of their own subspecies, the females of the migrating subspecies will become acclimated to increasingly higher pitches over subsequent generations, causing further divergence between the subspecies. Thus, if it were found that migrating males' tail feathers were producing higher pitches over time, that would support the researchers' hypothesis.

*Choice A* is incorrect because the researchers' hypothesis is that female flycatchers prefer the sounds produced by the tail feathers of males of their own subspecies, which will lead to further divergence between the two subspecies. This finding is about the shape of wing feathers and how that affects long-distance flight, whereas the hypothesis is about the shape of tail feathers and how that relates to female mate preference. *Choice C* is incorrect because the researchers' hypothesis is that female flycatchers prefer the sounds produced by the tail feathers of males of their own subspecies, which will lead to further divergence between the two subspecies. This finding focuses on how the tail feather sounds communicate different messages, which doesn't address differences between the subspecies or female preferences. *Choice D* is incorrect because the researchers' hypothesis is that female flycatchers prefer the sounds produced by the tail feathers of males of their own subspecies, which will lead to further divergence between the two subspecies. The finding that breeding habits haven't changed for either subspecies does not, by itself, suggest anything about female preferences or divergence between the two subspecies.

**QUESTION 15**

**Choice C** is the best answer because it most effectively completes the example regarding the ablation rate of iron. The table shows the ablation rates for three elements—iron, potassium, and sodium—found in cosmic dust that comes from one of four sources. The text says that the ablation rate for a given element in slower-moving SPC or AST dust was lower than the ablation rate for that same element in faster-moving HTC or OCC dust. The text then presents the first part of an example of this pattern, describing an ablation rate of 28% for iron in AST dust. The information that iron from HTC dust had an ablation rate of 90% is therefore the most effective way to complete this example—the comparison of a relatively low ablation rate for iron in slower-moving AST dust with a relatively high ablation rate for iron in faster-moving HTC dust illustrates the tendency of ablation rates for a given element to be lower in slower-moving dust than in faster-moving dust.

**Choice A** is incorrect because the text indicates that SPC dust, like AST dust, moves relatively slowly; a comparison of the ablation rates of iron from two slower-moving dust sources could not be an example of the difference between ablation rates in slower-moving dust and faster-moving dust, which is the pattern that the example is supposed to illustrate. **Choice B** is incorrect because the example in the text is supposed to illustrate the difference in the ablation rates of the same element from slower-moving dust and faster-moving dust, and the first part of the example provides data about the ablation rate of iron, which means the second part of the example must also be about the ablation rate of iron, not the ablation rate of sodium. **Choice D** is incorrect because the example in the text is supposed to illustrate the difference in the ablation rates of the same element from slower-moving dust and faster-moving dust, and the first part of the example provides data about the ablation rate of iron, which means the second part of the example must also be about the ablation rate of iron, not the ablation rate of sodium. Additionally, any ablation rate from AST dust would be ineffective in this example since AST dust is referenced in the first part of the example and thus additional data focused on AST dust would not illustrate a variation across dust types.

## QUESTION 16

**Choice A** is the best answer because it presents the quotation that best illustrates the journalist's claim. By indicating that a collective didn't continue because it was hard to share credit and responsibilities within the group even though the company was enjoyable, the quotation shows that working collaboratively can be difficult for artists who are used to having complete control over their work.

*Choice B* is incorrect because the quotation indicates that members of a collective are able to collaborate together and have agreed on a fair way to manage their responsibilities; this doesn't demonstrate the challenge of sharing control among members of a collective. *Choice C* is incorrect because the quotation highlights the support and encouragement of individual expression an artist experiences due to working in a collective; these positive aspects don't demonstrate the challenge of sharing control among members of a collective. *Choice D* is incorrect because the quotation doesn't address any challenges of sharing control among members of a collective; it simply indicates that artists sometimes choose to work with collectives without having to be a member. Therefore, the quotation doesn't illustrate the journalist's claim.

## QUESTION 17

**Choice A** is the best answer because it most effectively uses data from the table to complete the statement. The text explains that mycorrhizal hosts are plants that benefit from the presence of mycorrhizal fungi in the soil and that some such plants produce more mass when grown in the presence of these fungi, while for nonmycorrhizal species the fungi either have no effect or may be harmful. The experiment included two mycorrhizal hosts (corn and marigold) and one nonmycorrhizal species (broccoli). Given the claim in the text that nonmycorrhizal species will see either no difference or a decrease in mass when exposed to mycorrhizal fungi, the student would likely have been surprised by the higher average mass for broccoli grown in the presence of the fungi than the broccoli grown in the soil treated to kill fungi.

*Choice B* is incorrect. Although this choice accurately describes the corn data from the table, the fact that the mycorrhizal host corn is more massive in the presence of the fungi likely fits with what the student expected and would therefore not be surprising. *Choice C* is incorrect. Although this choice accurately describes the marigold data from the table, the fact that the mycorrhizal host marigold is more massive in the presence of the fungi is likely what the student expected and thus would not be surprising. *Choice D* is incorrect because it does not accurately represent the data in the table—when grown in soil treated to kill fungi, corn had an average mass of 3.8 g while broccoli had an average mass of 7g—and because making comparisons among the plants in the no-fungi condition, by itself, does not provide a basis to compare the average mass of mycorrhizal hosts and nonmycorrhizal species grown in the presence of the fungi with those grown in the soil treated to kill fungi.

## QUESTION 18

**Choice A** is the best answer because it presents the conclusion that most logically completes the text's discussion about the significance of the cupid found at Pompeii. The text indicates that the cupid is near a statue of a female figure who is fishing, and it goes on to indicate that because Venus is associated with cupids, some scholars believe the female figure to be the goddess Venus. But the text then says that, according to archaeologist Carla Brain, cupids may have also been associated with the activity of fishing, which, if true, would suggest that the mere appearance of a cupid near a female figure engaged in fishing does not indicate with certainty that the figure is Venus (that is, the cupid might be associated with fishing, and the figure might be anyone at all).

**Choice B** is incorrect because the text says nothing about how often Venus was depicted fishing in Roman art: it only implies that in certain instances a female figure may or may not be Venus. **Choice C** is incorrect because Carla Brain's proposed explanation for the presence of the cupids makes no reference to the female figure, and so the possibility that the figure in the artworks is in fact Venus cannot be definitively eliminated. **Choice D** is incorrect because there is nothing in the text to suggest that the only reasonable way to interpret the figure is as Venus.

## QUESTION 19

**Choice A** is the best answer. The convention being tested is the use of plural and possessive nouns. The plural possessive noun "people's" and the plural noun "stories" correctly indicate that there are multiple stories from multiple people.

**Choice B** is incorrect because the context requires the plural possessive noun "people's" and the plural noun "stories," not the plural noun "peoples" and the singular possessive noun "story's." **Choice C** is incorrect because the context requires the plural possessive noun "people's," not the plural noun "peoples." **Choice D** is incorrect because the context requires the plural noun "stories," not the singular possessive noun "story's."

## QUESTION 20

**Choice D** is the best answer. The convention being tested is the use of verbs to express tense. In this choice, the present tense verb "survives" correctly indicates that the wood frog regularly survives subfreezing temperatures by producing large amounts of glucose.

**Choice A** is incorrect because the past perfect verb "had survived" doesn't indicate that the wood frog regularly survives subfreezing temperatures by producing large amounts of glucose. **Choice B** is incorrect because the past tense verb "survived" doesn't indicate that the wood frog regularly survives subfreezing temperatures by producing large amounts of glucose. **Choice C** is incorrect because the conditional verb "would survive" doesn't indicate that the wood frog regularly survives subfreezing temperatures by producing large amounts of glucose.

## QUESTION 21

**Choice D** is the best answer. The convention being tested is punctuation use between sentences. In this choice, the period is used correctly to mark the boundary between one sentence ("Defying...fast") and another sentence that begins with a supplementary phrase ("During...Olympics").

*Choice A* is incorrect. When a dash is present in a sentence ("ran—fast"), it's not conventional to use another dash ("fast—during") to mark the boundary between sentences because it creates a potentially confusing sentence. In this context, a period, semicolon, or colon would be clear and more conventional. *Choice B* is incorrect because it results in a run-on sentence. The sentences ("Defying...fast") and ("during...Olympics") are fused without punctuation and/or a conjunction. *Choice C* is incorrect because it results in a comma splice. A comma can't be used in this way to mark the boundary between sentences.

## QUESTION 22

**Choice D** is the best answer. The convention being tested is subject-verb agreement. The singular verb "is" agrees in number with the singular subject "the triangle."

*Choice A* is incorrect because the plural verb "are" doesn't agree in number with the singular subject "the triangle." *Choice B* is incorrect because the plural verb "have been" doesn't agree in number with the singular subject "the triangle." *Choice C* is incorrect because the plural verb "were" doesn't agree in number with the singular subject "the triangle."

## QUESTION 23

**Choice B** is the best answer. The convention being tested is the coordination of main clauses within a sentence. This choice uses a semicolon in a conventional way to join the first main clause ("In 2004...sampler") and the second main clause ("in 2014...pillars").

*Choice A* is incorrect because it results in a comma splice. Without a conjunction following it, a comma can't be used in this way to join two main clauses. The word "later" is an adverb and cannot be used to join two main clauses unless it is preceded by a conjunction. *Choice C* is incorrect because it results in a comma splice. Without a conjunction following it, a comma can't be used in this way to join two main clauses. *Choice D* is incorrect because it results in a comma splice. Without a conjunction following it, a comma can't be used in this way to join two main clauses. The word "later" is an adverb and cannot be used to join two main clauses unless it is preceded by a conjunction.

## QUESTION 24

**Choice C** is the best answer. The convention being tested is subject-modifier placement. This choice makes the noun phrase “Julian’s 1935 synthesis” the subject of the sentence and places it immediately after the modifying phrase “named...years.” In doing so, this choice clearly establishes that Julian’s 1935 synthesis of the alkaloid physostigmine—and not another noun in the sentence—was named in 1999 as one of the greatest achievements by a US chemist in the past hundred years.

*Choice A* is incorrect because it results in a dangling modifier. The placement of the noun “Julian” immediately after the modifying phrase illogically suggests that Julian himself was named as one of the greatest achievements by a US chemist in the past hundred years. *Choice B* is incorrect because it results in a dangling modifier. The placement of the prepositional phrase “in 1935” immediately after the modifying phrase illogically and confusingly suggests that “in 1935” was named as one of the greatest achievements by a US chemist in the past hundred years. *Choice D* is incorrect because it results in a dangling modifier. The placement of the noun phrase “the alkaloid physostigmine” immediately after the modifying phrase illogically and confusingly suggests that the alkaloid physostigmine itself (not the synthesis of it) was named as one of the greatest achievements by a US chemist in the past hundred years.

## QUESTION 25

**Choice B** is the best answer. The convention being tested is the punctuation of items in a complex series (a series including internal punctuation). The semicolon after “nonnative” is correctly used to separate the first item (“growing diverse plant species, both native and nonnative”) and the second item (“fostering scientific research”) in the series of things that botanical gardens are dedicated to. Further, the comma after “species” is correctly used to separate the noun phrase “diverse plant species” and the supplementary phrase “both native and nonnative” that modifies it.

*Choice A* is incorrect because a comma (specifically, the comma after “nonnative”) can’t be used in this way to separate items in a complex series.

*Choice C* is incorrect because a semicolon can’t be used in this way to separate the noun phrase “diverse plant species” and the supplementary phrase “both native and nonnative” that modifies it. Further, a comma can’t be used in this way to separate items in a complex series. *Choice D* is incorrect because it fails to use appropriate punctuation to separate the noun phrase “diverse plant species” and the supplementary phrase “both native and nonnative” that modifies it. Further, a comma can’t be used in this way to separate items in a complex series.

## QUESTION 26

**Choice A** is the best answer. The convention being tested is the punctuation of a supplementary word or phrase between two main clauses. This choice correctly uses a comma to separate the supplementary adverb “however” from the preceding main clause (“Okinaka doesn’t...single-handedly”) and a semicolon to join the next main clause (“all...culture”) to the rest of the sentence. Further, placing the semicolon after “however” correctly indicates that the information in the preceding main clause (Okinaka doesn’t make such decisions single-handedly) is contrary to what might be assumed from the information in the previous sentence (Okinaka sits on the review board that adds new sites to the Hawaii Register of Historic Places).

**Choice B** is incorrect because placing the semicolon after “single-handedly” and the comma after “however” illogically indicates that the information in the next main clause (all historical designations must be approved by a group of experts) is contrary to the information in the previous clause (Okinaka doesn’t make such decisions single-handedly). **Choice C** is incorrect because it results in a comma splice. Commas can’t be used in this way to punctuate a supplementary word or phrase between two main clauses. **Choice D** is incorrect because it results in a run-on sentence. The two main clauses are fused without punctuation and/or a conjunction.

## QUESTION 27

**Choice C** is the best answer. “Finally” logically signals that the bill passing—following many attempts between 1968 and 1983—is the final, concluding event in the sequence described in the previous sentences.

**Choice A** is incorrect because “instead” illogically signals that the bill passing is an alternative to one of the events described in the previous sentences. It is the final event in the sequence. **Choice B** is incorrect because “likewise” illogically signals that the bill passing is similar to one of the events described in the previous sentences. Instead, it is the final event in the sequence. **Choice D** is incorrect because “additionally” illogically signals that the bill passing is merely another event described along with the events of the previous sentences. Instead, it is the final, concluding event in the sequence.

## QUESTION 28

**Choice D** is the best answer. “However” logically signals that this sentence, which indicates that the Pūhāhonu volcano may be larger than the Mauna Loa volcano, offers a contrast to or refutation of the previous assumption that Mauna Loa is the largest shield volcano.

**Choice A** is incorrect because “secondly” illogically signals that this sentence merely offers an additional or secondary point concerning the previous assumption that Mauna Loa is the largest shield volcano. Instead, the sentence offers a contrast to or refutation of that assumption. **Choice B** is incorrect because “consequently” illogically signals that this sentence offers a result or consequence of the previous assumption that Mauna Loa is the largest shield volcano. Instead, the sentence offers a contrast to or refutation of that assumption. **Choice C** is incorrect because “moreover” illogically signals that this sentence merely adds to the previous

assumption that Mauna Loa is the largest shield volcano. Instead, the sentence offers a contrast to or refutation of that assumption.

## QUESTION 29

**Choice A** is the best answer. “In addition” logically signals that the detail in this sentence—that Coleridge-Taylor included traditional African music in his classical compositions—adds to the information in the previous sentence. Specifically, the previous sentence indicates one way in which Coleridge-Taylor emphasized his mixed-race ancestry, and the claim that follows indicates a second, additional way.

**Choice B** is incorrect because “actually” illogically signals that the detail in this sentence is surprising in light of the information in the previous sentence. Instead, the detail adds to the information, indicating a second, additional way in which Coleridge-Taylor emphasized his mixed-race ancestry. **Choice C** is incorrect because “however” illogically signals that the detail in this sentence contrasts with the information in the previous sentence. Instead, the detail adds to the information, indicating a second, additional way in which Coleridge-Taylor emphasized his mixed-race ancestry. **Choice D** is incorrect because “regardless” illogically signals that the detail in this sentence is true despite the information in the previous sentence. Instead, the detail adds to the information, indicating a second, additional way in which Coleridge-Taylor emphasized his mixed-race ancestry.

## QUESTION 30

**Choice A** is the best answer. “Therefore” logically signals that the action described in this sentence—the researchers theorizing that the dish was named for its effect on diners—is a result or consequence of the previous observation that the dish had a calming effect.

**Choice B** is incorrect because “alternately” illogically signals that the action described in this sentence offers an alternative or contrast to the previous observation that the dish had a calming effect. Instead, the action is a result or consequence of that observation. **Choice C** is incorrect because “nevertheless” illogically signals that the action described in this sentence occurs despite the previous observation that the dish had a calming effect. Instead, the action is a result or consequence of that observation. **Choice D** is incorrect because “likewise” illogically signals that this sentence merely adds a second, similar detail to the previous observation that the dish had a calming effect. Instead, this sentence describes an action that is a result or consequence of that observation.

## QUESTION 31

**Choice D** is the best answer. The sentence emphasizes a difference between baking soda and baking powder, noting that baking soda needs to be mixed with an acidic ingredient to produce carbon dioxide but baking powder doesn’t.

**Choice A** is incorrect. The sentence focuses on what bakers use to make batters rise; it doesn’t emphasize a difference between baking soda and baking powder. **Choice B** is incorrect. The sentence provides a general description of baking soda



and baking powder; it doesn't emphasize a difference between them. *Choice C* is incorrect. The sentence explains what baking soda and honey are; it doesn't emphasize a difference between baking soda and baking powder.

## QUESTION 32

**Choice D** is the best answer. The sentence effectively describes *Unwoven Light* to an audience unfamiliar with Park, noting that Soo Sunny Park is a Korean American artist and that the 2013 work consists of colorful prisms formed by light passing through iridescent tiles.

*Choice A* is incorrect. The sentence describes aspects of *Unwoven Light* but doesn't mention who Park is; it thus doesn't effectively describe the work to an audience unfamiliar with Park. *Choice B* is incorrect. Although the sentence indicates when the work was created and who Park is, it lacks descriptive details and thus doesn't effectively describe *Unwoven Light*. *Choice C* is incorrect. The sentence mentions Park and describes an aspect of *Unwoven Light*—the chain-link fence—but doesn't effectively describe the overall work to an audience unfamiliar with the artist.

## QUESTION 33

**Choice C** is the best answer. The sentence effectively presents Tan's research to an audience unfamiliar with Angkor Wat, explaining the results of the research and identifying Angkor Wat as a temple in Cambodia.

*Choice A* is incorrect. While the sentence presents Tan's research, it fails to explain what Angkor Wat is for an audience unfamiliar with the temple. *Choice B* is incorrect. The sentence emphasizes the role that decorrelation stretch analysis played in Tan's research; it doesn't present the research, which would require specifying where it was conducted. *Choice D* is incorrect. While the sentence explains what Angkor Wat is, it fails to present Tan's research.

# Reading and Writing

## Module 2

(33 questions)

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### QUESTION 1

**Choice D** is the best answer because it most logically completes the text's discussion of the fashion resale market's continued growth. As used in this context, "predicted" means forecast, or indicated that something would happen in the future. The text indicates that the fashion resale market made a lot of money in 2019 and that some analysts expected the market to continue to grow. This context suggests that the analysts believed that the fashion resale market was going to make more money than it had already made, with the analysts indicating that revenues would more than double by 2028.

*Choice A* is incorrect because it wouldn't make sense in context to say that some analysts "produced," or manufactured or brought about, the increase in future revenues of the fashion resale market. The analysts themselves couldn't have brought about the future revenue growth, since, as the text suggests, they were merely in the position of drawing conclusions about future fashion resale market revenue based on 2019 revenue. *Choice B* is incorrect because the text indicates that some analysts expected the fashion resale market to continue to grow in the future, not that they "denied," or rejected, this notion. Nothing in the text supports the idea that these analysts thought the revenues wouldn't grow. *Choice C* is incorrect because the text indicates that some analysts expected the fashion resale market to continue to grow in the future, not that they "worried," or felt concerned, that revenue would significantly increase by 2028. Nothing in the text suggests that the analysts felt concerned about the increase; rather, the text suggests that the increase would represent a favorable outcome, since it would mean that the fashion resale market grew to generate even more revenue.

## QUESTION 2

**Choice D** is the best answer because it most logically completes the text's discussion of delivering biomolecules to plant cells. In this context, "overcome" means to succeed in dealing with an obstacle. The text suggests that although it's difficult to move biomolecules through plant cell walls, Landry and her colleagues have shown that carbon nanotubes may be useful, since they can cross cell walls. This context conveys that Landry and her colleagues think it's possible, using carbon nanotubes, to succeed in dealing with the obstacle of transmitting biomolecules to plant cells.

**Choice A** is incorrect because it wouldn't make sense in context to say that Landry and her colleagues have shown that it may be possible to "conceptualize," or form an idea of, the difficulty of transmitting biomolecules through the walls of plant cells. The text presents this difficulty as a known problem that Landry and her colleagues think they may have solved, not as a mysterious occurrence that they have yet to form ideas about. **Choice B** is incorrect because the text suggests that Landry and her colleagues think it may be possible to successfully deal with the problem of transmitting biomolecules through the walls of plant cells, not that Landry and her colleagues think it may be possible to "neglect," or simply to disregard and ignore the problem. **Choice C** is incorrect because it wouldn't make sense in context to say that Landry and her colleagues have shown that it may be possible to "illustrate," or demonstrate, the difficulty of transmitting biomolecules through the walls of plant cells by using carbon nanotubes. According to the text, carbon nanotubes allow molecules to be transmitted to plant cells—something that is otherwise difficult to do. The text therefore presents carbon nanotubes as a way of possibly solving a problem, not as a means of demonstrating the problem.

## QUESTION 3

**Choice B** is the best answer because it most logically completes the text's discussion of the work of particle physicists. In this context, "inspecting" means viewing closely in order to examine. The text indicates that as particle physicists, Arce and El-Khadra's work involves using advanced technology to "closely examine" subatomic particles. In other words, they use technology to inspect small parts of matter that can't be seen by the naked eye.

**Choice A** is incorrect because nothing in the text suggests that Arce and El-Khadra spend time "selecting," or choosing, subatomic particles for some purpose; the text simply states that the particle physicists use advanced technology to see and study the behavior of those tiny parts of matter. **Choice C** is incorrect because nothing in the text suggests that Arce and El-Khadra spend time "creating" subatomic particles, or bringing them into existence; the text simply states that the particle physicists use advanced technology to see and study the behavior of those tiny parts of matter. **Choice D** is incorrect. In this context, "deciding" would mean making a final choice or judgment about something. It wouldn't make sense to say that particle physicists get to choose what is and isn't visible to the naked eye, especially when the text presents it as fact that subatomic particles are "the smallest detectable parts of matter" and would therefore be invisible. The text focuses on Arce and El-Khadra's close observation of those particles, not on any decisions they might make.

## QUESTION 4

**Choice B** is the best answer because it most logically completes the text's discussion of the fossilized bones of the hominin known as Little Foot. As used in this context, "comparable to" would mean similar to. The text indicates that the relationship between the fossilized clavicle and shoulder bones of Little Foot and the clavicle and shoulder bones of "frequent climbers," such as chimpanzees and gorillas, suggests that Little Foot had adapted to moving around in trees. This context suggests that the relationship between the fossilized bones of Little Foot and the bones of chimpanzees and gorillas is one of similarity—the Little Foot fossils are likely comparable to the modern ape bones.

**Choice A** is incorrect because if the fossilized bones of Little Foot were "surpassed by," or exceeded by or made inferior to, the bones of modern apes that are frequent climbers, it wouldn't suggest, as the text says, that Little Foot was adapted to moving around in trees. If anything, learning that Little Foot's clavicle and shoulder bones were surpassed by those of chimpanzees and gorillas would suggest that Little Foot was poorly adapted to climbing. **Choice C** is incorrect because if Little Foot's fossilized clavicle and shoulder bones were "independent of," or not influenced by or affiliated with, the bones of modern apes that climb often, it wouldn't suggest, as the text says, that Little Foot was adapted to moving around in trees. **Choice D** is incorrect because the text indicates that Little Foot's fossilized bones date to 3.6 million years ago, so they couldn't have been "obtained from," or acquired from, the bones of modern apes.

## QUESTION 5

**Choice B** is the best answer because it most logically completes the text's discussion of Samuel R. Delany's character Rydra Wong. As used in this context, "atypical" would mean unrepresentative or not common. The text indicates that Wong is one of "nearly a dozen" characters in Delany's novels who are poets or writers. This context conveys that being a poet isn't an atypical occupation for a character in one of Delany's works.

**Choice A** is incorrect because "infallible" means to be accurate or without fault, which wouldn't make sense in context. The text focuses on the fact that Delany has written many characters who are poets and writers. This context suggests that the occupation isn't atypical for Delany, not that the occupation isn't infallible, or problematic. **Choice C** is incorrect because "lucrative" means to be profitable, which wouldn't make sense in context. If writing poet characters weren't profitable, it wouldn't be logical to explain this by citing that Delany gave many of his characters the same occupation. **Choice D** is incorrect because "tedious" means to be boring, which wouldn't make sense in context. The text focuses on the fact that Delany has written many characters who are poets and writers. This context suggests that the occupation isn't atypical for Delany, not that the occupation isn't tedious.

## QUESTION 6

**Choice B** is the best answer because it most logically and precisely completes the text's discussion of Jeyifous's series of images for the 2020 exhibition. In this context, "created" means produced. The text explains that Jeyifous, a photographer and neurobiologist, photographed adults who had appeared as children in posters from the 1970s, then combined those photographs with magnified images of the adults' cells—a process that resulted in what he called "micro and macro portraiture." This context suggests that Jeyifous drew on his dual interests in photography and neurobiology to produce the images for display in the exhibition.

**Choice A** is incorrect because there's nothing in the text to suggest that Jeyifous "validated," or corroborated, the series of images. The text describes Jeyifous's process for composing the images but doesn't describe Jeyifous making an effort to evaluate the images for their artistic or scientific legitimacy. **Choice C** is incorrect because there's nothing in the text to suggest that Jeyifous "challenged," or disputed, an aspect of the images; rather, the focus of the text is on the inspiration behind the images and the method Jeyifous used to achieve them.

**Choice D** is incorrect because the text indicates that Jeyifous made the images himself using a combination of photography and magnified pictures of cells, not that he "restored," or reconditioned, the images from a deteriorated state.

## QUESTION 7

**Choice A** is the best answer because it most logically completes the text's discussion of Francis Cecil Sumner. As used in this context, "proponent of" means supporter of. The text says that Sumner helped to found the psychology department at historically Black Howard University in 1930. This is evidence that Sumner supported increasing the opportunity for Black students to study psychology.

**Choice B** is incorrect because the phrase "supplement to," or addition to, wouldn't make sense in context. The text discusses Sumner's efforts to increase the number of Black psychology students, but it doesn't make sense to describe him as an addition to his efforts. **Choice C** is incorrect because Sumner was already an accomplished psychologist himself when he helped to found the Howard University psychology department. While Black students were the beneficiaries of his efforts—that is, they received help because of his efforts—it wouldn't make sense in this context to describe Sumner as a "beneficiary of" opportunities, because he was the one doing the helping. **Choice D** is incorrect because founding a psychology department at Howard University wouldn't be a "distraction for" Sumner's aim to increase the opportunity for Black students to study psychology—that is, it wouldn't be something that draws Sumner's attention away from that goal, but rather the opposite.

## QUESTION 8

**Choice C** is the best answer because it most logically completes the text's discussion of the legitimacy of the reigns of French monarchs such as Hugh Capet and Henry I. As used in this context, "buttress" means to strengthen or defend. The text indicates that regardless of whether a French monarch's reign was significant or uneventful, each monarch faced questions about his right to the throne. The text goes on to say that in order to understand the path of a French monarch's reign, it's important to understand what contributed to the monarch's ability to "hold the throne." This context suggests that French monarchs such as Hugh Capet and Henry I had to buttress, or defend, their right to be monarch.

**Choice A** is incorrect. Saying that a monarch who is faced with questions about the legitimacy of his reign was able to "reciprocate" his right to the French throne would mean that he either returned his right to the throne or that he responded in kind to the challenge. Neither of these meanings would make sense in context because the text focuses on people who did reign as French monarchs and defended their right to do so. **Choice B** is incorrect because it wouldn't make sense in context to discuss factors that enabled a monarch to "annotate," or add notes to or explain, his right to the French throne. Nothing in the text suggests that the monarchs were writing notes about their right to the throne; instead, faced with questions about the legitimacy of their reign, the monarchs defended their right. **Choice D** is incorrect because it wouldn't make sense in context to discuss factors that enabled a monarch to "disengage," or withdraw his right to the French throne. The text focuses on an examination of people who reigned as French monarchs, not on people who didn't choose to rule.

## QUESTION 9

**Choice C** is the best answer because it best describes how the underlined sentence functions in the text as a whole. The first two sentences establish that birds of some species don't raise their own young; instead, they lay their eggs in the nests of birds of other species. The underlined sentence then states that female cuckoo birds engage in this behavior, having been observed specifically laying their eggs in other nests while the other birds are out finding food. According to the text, the cuckoo chicks are then raised by the other birds. Thus, the underlined sentence provides a particular detail about how female cuckoos carry out the behavior of laying eggs for other birds to raise.

**Choice A** is incorrect. Rather than mentioning a physical feature of female cuckoos, the underlined sentence introduces a specific behavior of female cuckoos: laying eggs in the nests of birds of other species when the other birds are away. The only reference to physical features is the last sentence's general mention of cuckoo chicks looking different from chicks of other species. **Choice B** is incorrect because the underlined sentence refers to the nests of birds other than cuckoos and doesn't describe how any nests look, cuckoo or otherwise. Instead, the sentence addresses how female cuckoos use other birds' nests. **Choice D** is incorrect because the underlined sentence describes only female cuckoo behavior (laying eggs in the nests of birds of other species when the other birds are away); it's the last sentence of the text that addresses the other birds' reaction, indicating that those birds usually raise the cuckoo chicks once they've hatched.

## QUESTION 10

**Choice A** is the best answer because it explains how the researchers determined the level of surprise displayed by the cats in the study. The text states that Saho Takagi and colleagues played recordings of the voice of each cat's owner and measured how surprised the cat was by the recording based on how it moved its ears and head.

**Choice B** is incorrect because, as the text explains, the recordings played for each cat in the study were of the voice of the cat's owner, not a stranger's voice. **Choice C** is incorrect because the text explains that during the study, the cats didn't interact directly with their owners; instead, the cats listened to recordings of their owners' voices. **Choice D** is incorrect because the text doesn't indicate that the researchers monitored the cats' movement around the room in which the study was conducted.

## QUESTION 11

**Choice A** is the best answer because it describes an experimental outcome that would most directly weaken the student's hypothesis. According to the text, the student hypothesizes that *Brassica rapa parachinensis* (choy sum) will benefit more from acidic soil than it will from neutral soil. The text then explains that the student planted 16 choy sum seeds in potting soil with coffee grounds added to increase acidity and another 16 seeds in soil without coffee grounds as a control (a group identical to the experimental group except for the experimental modification being tested). If the hypothesis were correct, the plants in the more acidic soil-and-coffee-grounds mixture would grow faster than those in the control group. However, choice A proposes a scenario in which the plants in soil without coffee grounds were "significantly taller" than those in the more acidic mixture—an outcome that weakens the hypothesis that higher acidity is beneficial to the plants' growth.

**Choice B** is incorrect. If the choy sum planted in the neutral soil produced less plant matter and therefore weighed less than the choy sum planted in the acidic soil-and-coffee-grounds mixture, this finding would strengthen the student's hypothesis, not weaken it. **Choice C** is incorrect. If seeds planted in neutral soil (without coffee grounds) sprouted significantly later than seeds planted in the acidic soil-and-coffee-grounds mixture, this finding would strengthen, not weaken, the student's hypothesis that acidic soil benefits choy sum. **Choice D** is incorrect. If seeds planted in the neutral soil (without coffee grounds) sprouted significantly fewer plants than seeds planted in the acidic soil-and-coffee-grounds mixture did, this finding would strengthen, not weaken, the student's hypothesis that choy sum benefits from acidic soil.

## QUESTION 12

**Choice B** is the best answer because it most effectively illustrates the claim in the text that in describing the teenaged girl, Mansfield contrasts the character's pleasant appearance with her unpleasant attitude. In the quotation, Mansfield describes the teenager as having a "lovely nose" (a compliment about her appearance) but also as treating her makeup puff "as though she loathed it" (a judgment suggesting her unpleasant attitude).

**Choice A** is incorrect because the teenager's reaction to the flowers doesn't make it clear that she has an unpleasant attitude, and nothing in the quotation indicates that any part of her appearance is pleasant. **Choice C** is incorrect because the quotation suggests that the teenager has an unpleasant attitude (being upset with the location and leaving the table before the narrator has paid for the meal) but doesn't give any indication that she has a pleasant appearance. **Choice D** is incorrect because the quotation suggests that the teenager may have an unpleasant attitude (lowering her eyes, wincing, and sitting in silence) but doesn't give any indication that any part of her appearance is pleasant.

## QUESTION 13

**Choice D** is the best answer because it uses data from the graph to effectively illustrate the text's claim about general economic policy uncertainty in the United Kingdom. The graph presents values for economic policy uncertainty in tax and public spending policy, trade policy, and general economic policy in the UK from 2005 to 2010. The graph shows that in 2005, the value for general economic policy uncertainty (approximately 90) was substantially lower than the value for uncertainty about trade policy specifically (approximately 160). It also shows that in 2010, the value for general economic policy uncertainty (approximately 120) was substantially higher than the value for uncertainty about trade policy (approximately 70). The substantial differences between these values in 2005 and 2010 support the claim that a general measure may not fully reflect uncertainty about specific areas of policy.

**Choice A** is incorrect because the graph shows that the level of general economic policy uncertainty was similar to the level of uncertainty about tax and public spending policy in both 2005 (with values of approximately 90 and 100, respectively) and 2009 (with values of approximately 80 and 75, respectively). **Choice B** is incorrect because the graph shows that general economic policy uncertainty was higher than uncertainty about tax and public spending policy in 2006, 2007, and 2009, not that it was lower each year from 2005 to 2010. **Choice C** is incorrect because the graph shows that general economic policy uncertainty reached its highest level in 2010, which was when uncertainty about tax and public spending policy also reached its highest level, not its lowest level.



## QUESTION 14

**Choice C** is the best answer because it presents the finding that, if true, would most strongly support Tannen's hypothesis. According to the text, Tannen's hypothesis is that multiple perspectives presented in a noncompetitive format is more informative than a debate between opposing viewpoints is. If participants who saw a panel of three commentators with various views about an issue answered more questions about the issue correctly than did participants who saw a debate, that would support Tannen's hypothesis since it would show that participants who heard multiple varied perspectives were better informed than were participants who heard a debate between opposing viewpoints.

**Choice A** is incorrect because finding that participants perceived commentators in the debate as more knowledgeable than commentators in the panel is irrelevant to Tannen's hypothesis, which is that presenting multiple perspectives on an issue is more informative to the audience than presenting opposing views of the issue is. Participants' perception of how knowledgeable panelists are has no bearing on how much participants learn from the panelists. **Choice B** is incorrect because finding that participants perceived commentators in the panel as more knowledgeable than a single commentator is irrelevant to Tannen's hypothesis, which is that presenting multiple perspectives on an issue is more informative to the audience than presenting opposing views of the issue is. Participants' perception of how knowledgeable panelists are has no bearing on how much participants learn from the panelists, and Tannen's hypothesis says nothing about how informative single commentators are. **Choice D** is incorrect because finding that participants who watched a single commentator answered more questions correctly than participants who watched the debate did wouldn't be relevant to Tannen's hypothesis, which is that hearing multiple varying perspectives is more informative than hearing a debate. Tannen's hypothesis says nothing about how informative single commentators are.

## QUESTION 15

**Choice C** is the best answer because it most effectively uses a quotation from *King Lear* to illustrate the claim that King Lear expresses regret for his actions. In the quotation, Lear describes striking himself on the head—the same act he's engaged in as he speaks, and one that suggests he's deeply upset with himself. Referring to himself in the second person (with "thy"), the character exclaims "Beat at this gate that let thy folly in / And thy dear judgement out!" Lear refers metaphorically to his own mind as a gate that has allowed folly, or poor judgement, to enter and good judgement to escape. This suggests that Lear regrets his attempts to test his three daughters' devotion to him, regarding those attempts as examples of the folly that has entered the gate of his mind.

*Choice A* is incorrect because this quotation doesn't express King Lear's sense of regret over his own actions; instead, it expresses his belief that the harm that others have done to him (or the extent to which they have "sinned against" him) outweighs whatever harm he himself has caused by "sinning." *Choice B* is incorrect because this quotation doesn't express King Lear's sense of regret over his own actions; instead, it expresses his thoughts about an approaching storm ("this tempest"), which he believes "will not give [him] leave to ponder," or time to consider, the harm that he will continue to experience ("things" that "would hurt [him] more"). *Choice D* is incorrect because this quotation expresses King Lear's vow to commit terrible actions (or "things" that "shall be / The terrors of the earth") in the future, not his regret over actions that he's already taken.

## QUESTION 16

**Choice A** is the best answer because it most logically completes the text's discussion of the relative appeal of different kinds of plays by Shakespeare to today's audiences. According to the text, Shakespeare's tragedies address broad themes that continue to appeal to today's audiences. Indeed, the text suggests that these themes are timeless, as illustrated by the example of *Romeo and Juliet*, which the text states is still read and widely performed despite being set in the Italy of Shakespeare's time. In contrast, the text indicates that audiences and readers may need to be familiar with several centuries of English history in order to understand Shakespeare's history plays. Because many theatergoers and readers are unlikely to possess such extensive historical knowledge, it follows that they are likely to find Shakespeare's history plays less engaging than his more accessible tragedies.

*Choice B* is incorrect because the text never introduces a comparison between Shakespeare's tragedies and twentieth-century plays, only between Shakespeare's tragedies and his history plays. Since twentieth-century plays aren't mentioned, there's no basis in the text for the idea that some of Shakespeare's tragedies are more relevant than twentieth-century plays to today's audiences. *Choice C* is incorrect. Although the text indicates that *Romeo and Juliet* is thematically accessible to today's audiences, it doesn't suggest that *Romeo and Juliet* is more accessible than Shakespeare's other tragedies. Rather, the text presents *Romeo and Juliet* as an example to support the idea that Shakespeare's tragedies hold continued appeal for today's readers and theatergoers. *Choice D* is incorrect. Although experts in English history would likely possess the knowledge needed to understand Shakespeare's history plays, the text never mentions such experts or suggests that they would enjoy the history plays more than Shakespeare's other works.

## QUESTION 17

**Choice B** is the best answer because it presents the conclusion that most logically follows from the text's discussion of Ancestral Puebloans' migration to the Rio Grande Valley. The text states that in the late 1200s C.E., the Ancestral Puebloan civilization abandoned villages in its original homeland, which included the Mesa Verde site. The text goes on to say that recent genetic analysis has demonstrated that the modern turkey population in the Rio Grande Valley descends partly from the ancient turkeys raised at Mesa Verde, and that the genetic markers shared by the two turkey populations first appeared at Mesa Verde only after 1280 C.E. Therefore, it can reasonably be concluded that some Ancestral Puebloans migrated to the Rio Grande Valley in the late 1200s and carried their agricultural practices—including the farming of turkeys—to their new home.

**Choice A** is incorrect because the text never compares the condition of the Rio Grande Valley's terrain to that of Mesa Verde's terrain, either in the present or in the past. **Choice C** is incorrect. Although genetic analysis has demonstrated that the modern turkey population in the Rio Grande valley descended in part from the turkey population raised by the Ancestral Puebloans of Mesa Verde before their migration to the valley in 1280, this finding doesn't eliminate the possibility that Indigenous peoples living in the valley before 1280 might also have farmed turkeys. **Choice D** is incorrect. The text doesn't consider the possibility that before their migration to the Rio Grande Valley after 1280, the Ancestral Puebloans of Mesa Verde might have adopted turkey farming from an outside Indigenous civilization in another region; instead, the text provides evidence suggesting that the Ancestral Puebloans brought turkey farming to another region—the Rio Grande Valley—after 1280.

## QUESTION 18

**Choice D** is the best answer because it presents the conclusion that most logically follows from the text's discussion of the challenge researchers face when studying the effects of holding elected office on a person's behavior. The text explains that it's hard for researchers to test for the effects that elected office has on people because finding people to serve as a control group is difficult. The text indicates that a control group needs to be made up of people who share characteristics of the group being tested but don't have the variable being tested (in this case, holding elected office). Because researchers aren't able to influence who wins elections, they're also unable to determine who would serve as an appropriately similar member of a control group. Thus, it logically follows that researchers will find it difficult to identify a group of people who can function as an appropriate control group for their studies.

**Choice A** is incorrect because the text focuses on the struggle to put together a control group for experiments; it doesn't suggest that finding information about politicians' behavior is difficult. **Choice B** is incorrect because the experiments mentioned in the text are testing the effects of holding elected office on a person's behavior. Studying people who have already held elected office wouldn't provide an opportunity to note any behavioral changes that the position might cause. **Choice C** is incorrect because the text defines people in a control group as those "who are otherwise similar to the office-holders"; selecting people who differ from the office-holders wouldn't fit the criteria for an appropriate control group.

## QUESTION 19

**Choice C** is the best answer. The convention being tested is the use of plural and possessive nouns. The plural nouns “stories” and “immigrants” correctly indicate that the memoir tells multiple stories of multiple immigrants.

*Choice A* is incorrect because the context requires the plural noun “stories,” not the singular possessive noun “story’s.” *Choice B* is incorrect because the context requires the plural nouns “stories” and “immigrants,” not the singular possessive noun “story’s” and the plural possessive noun “immigrants’.” *Choice D* is incorrect because the context requires the plural nouns “stories” and “immigrants,” not the plural possessive noun “stories’” and the singular possessive noun “immigrant’s.”

## QUESTION 20

**Choice A** is the best answer. The convention being tested is punctuation between a preposition and its complement. No punctuation is needed between the preposition “of” and its complement, the noun phrase “healing, self-discovery, and memory.”

*Choice B* is incorrect because no punctuation is needed between a preposition and its complement. *Choice C* is incorrect because no punctuation is needed between a preposition and its complement. *Choice D* is incorrect because no punctuation is needed between a preposition and its complement.

## QUESTION 21

**Choice B** is the best answer. The convention being tested is the use and punctuation of an integrated relative clause. This choice correctly uses the relative pronoun “that” and no punctuation to create an integrated relative clause that provides essential information about the noun phrase (“a book packaging company”) that it modifies.

*Choice A* is incorrect because it doesn’t use a relative pronoun to link the verb phrase beginning with “specializes” to the noun phrase that it modifies (“a book packaging company”). *Choice C* is incorrect because it doesn’t use a relative pronoun to link the verb phrase beginning with “specializes” to the noun phrase that it modifies (“a book packaging company”). *Choice D* is incorrect because no punctuation is needed between the integrated relative clause beginning with “that specializes” and the noun phrase that it modifies (“a book packaging company”).

## QUESTION 22

**Choice D** is the best answer. The convention being tested is the punctuation of a supplementary element within a sentence. The comma after “(<sup>13</sup>C)” pairs with the comma after “isotope” to separate the supplementary element “carbon-13 (<sup>13</sup>C)” from the rest of the sentence. This supplementary element defines the “rare carbon isotope,” and the pair of commas indicates that this element could be removed without affecting the grammatical coherence of the sentence.

*Choice A* is incorrect because it fails to use appropriate punctuation to separate the supplementary element “carbon-13 (<sup>13</sup>C)” from the rest of the sentence.

*Choice B* is incorrect because it fails to use appropriate punctuation to separate the supplementary element “carbon-13 (<sup>13</sup>C)” from the rest of the sentence.

*Choice C* is incorrect because it fails to use appropriate punctuation to separate the supplementary element “carbon-13 (<sup>13</sup>C)” from the rest of the sentence. The comma after “carbon-13” isn’t necessary because the parentheses around “<sup>13</sup>C” already separate this element from the rest of the sentence.

## QUESTION 23

**Choice D** is the best answer. The convention being tested is punctuation use between sentences. In this choice, the period after “walls” is used correctly to mark the boundary between the first sentence (“In...walls”) and the second sentence (“With...techniques”), which starts with a supplementary phrase.

*Choice A* is incorrect because it results in a comma splice. A comma can’t be used in this way to mark the boundary between sentences. *Choice B* is incorrect because it results in a run-on sentence. The sentences (“In...walls” and “with...paintings”) are fused without punctuation and/or a conjunction. *Choice C* is incorrect. Without a comma preceding it, the conjunction “so” can’t be used in this way to join sentences.

## QUESTION 24

**Choice A** is the best answer. The convention being tested is the use of finite and nonfinite verb forms within a sentence. The nonfinite to-infinitive “to forge” is correctly used to form a nonfinite (infinitive) clause that explains why the chemists re-created and reprogrammed the DNA-cleaving bacteria.

*Choice B* is incorrect. Without a comma separating the main clause (“chemists...bacteria”) from the participle “forging,” this choice illogically suggests that the bacteria are forging a tool, which doesn’t make sense. *Choice C* is incorrect. Without a coordinating conjunction such as “and” placed before it, the finite past tense verb “forged” can’t be used in this way to describe the chemists’ actions. *Choice D* is incorrect. If read as a finite verb, the present progressive verb “forging” isn’t consistent with the past tense verbs used in this sentence to describe the actions of the chemists. If read as a nonfinite verb, the participle “forging” can’t be used in this way because there is no following main clause for it to modify.

## QUESTION 25

**Choice B** is the best answer. The convention being tested is subject-modifier placement. This choice makes the noun phrase “the bioswales” the subject of the sentence and places it immediately after the modifying phrase “By reducing... sewers.” In doing so, this choice clearly establishes that the bioswales—and not another noun in the sentence—are reducing runoff flowing into city sewers.

*Choice A* is incorrect because it results in a dangling modifier. The placement of the noun phrase “the mitigation...waterways” immediately after the modifying phrase results in unclear modification. The resulting sentence makes it hard to determine what is responsible for “reducing the runoff”: the bioswales or some other noun in the sentence. *Choice C* is incorrect because it results in a dangling modifier. The placement of the noun phrase “the bioswales’ mitigation...waterways” immediately after the modifying phrase results in unclear modification. The resulting sentence makes it hard to determine what is responsible for “reducing the runoff”: the bioswales or some other noun in the sentence. *Choice D* is incorrect because it results in a dangling modifier. The placement of the noun phrase “street flooding and the resulting pollution” immediately after the modifying phrase illogically suggests that the “flooding and pollution” are reducing runoff flowing into city sewers.

## QUESTION 26

**Choice B** is the best answer. The convention being tested is punctuation use between a main clause and a supplementary phrase. In this choice, a colon is correctly used to mark the boundary between the main clause (“A study... continents”) and the supplementary phrase (“geological...above”) and to introduce the following explanation of the origin of Earth’s continents.

*Choice A* is incorrect because it fails to mark the boundary between the main clause (“A study...continents”) and the supplementary phrase (“geological...above”) with appropriate punctuation. *Choice C* is incorrect because a semicolon can’t be used in this way to join the main clause (“A study...continents”) and the supplementary phrase (“geological...above”). A semicolon is conventionally used to join two main clauses, whereas a colon is conventionally used to introduce an element that explains or amplifies the information in the preceding clause, making it the better choice in this context. *Choice D* is incorrect because it results in a rhetorically unacceptable sentence fragment beginning with “geological.”

## QUESTION 27

**Choice A** is the best answer. “Afterward” logically signals that the events described in this sentence—the CEO’s public acknowledgment and apology—occurred after the rocket booster’s failure and are part of a chronological sequence of events.

*Choice B* is incorrect because “additionally” illogically signals that the events described in this sentence merely occurred in addition to the rocket booster’s failure. Instead, they occurred after the rocket booster’s failure and are part of a chronological sequence of events. *Choice C* is incorrect because “indeed” illogically signals that the events described in this sentence emphasize or strengthen a statement made in the previous sentence. Instead, they occurred after the rocket booster’s failure and are part of a chronological sequence of events. *Choice D* is incorrect because “similarly” illogically signals that the events described in this sentence are similar to the rocket booster’s failure. Instead, they occurred after the rocket booster’s failure and are part of a chronological sequence of events.

## QUESTION 28

**Choice A** is the best answer. “Alternatively” logically signals that the soil decontamination method described in this sentence—removing toxic metals from the soil via phytoremediation—offers an alternative to the previously described method (removing the contaminated soil from the ground).

*Choice B* is incorrect because “specifically” illogically signals that the soil decontamination method described in this sentence specifies or elaborates on an aspect of the previously described method (removing the contaminated soil from the ground). Instead, phytoremediation is an alternative to that method. *Choice C* is incorrect because “for example” illogically signals that the soil decontamination method described in this sentence is an example of the previously described method (removing the contaminated soil from the ground). Instead, phytoremediation is an alternative to that method. *Choice D* is incorrect because “as a result” illogically signals that the soil decontamination method described in this sentence is a result or consequence of the previously described method (removing the contaminated soil from the ground). Instead, phytoremediation is an alternative to that method.

## QUESTION 29

**Choice C** is the best answer. The sentence explains an advantage of the Hanke-Henry calendar, noting that it supports more predictable scheduling than does the Gregorian calendar and describing how it does so (by having calendar dates occur on the same day each year).

*Choice A* is incorrect. The sentence compares the number of days in the Gregorian and Hanke-Henry calendars; it doesn't explain an advantage of the Hanke-Henry calendar. *Choice B* is incorrect. While the sentence refers to a possible reason to adopt the Hanke-Henry calendar—that doing so would help solve a problem with the Gregorian calendar—it doesn't identify the problem or the solution and thus doesn't explain the advantage of the Hanke-Henry calendar. *Choice D* is incorrect. The sentence describes the origins of the Hanke-Henry calendar; it doesn't explain an advantage of it.

## QUESTION 30

**Choice C** is the best answer. The sentence effectively presents the influence theory to an audience unfamiliar with the Haudenosaunee Confederacy, explaining the theory's position that the Great Law of Peace influenced the US Constitution while avoiding mention of the Haudenosaunee Confederacy itself.

*Choice A* is incorrect. The sentence broadly emphasizes Johansen's ideas about the Great Law of Peace; it doesn't identify the influence theory or effectively present it. *Choice B* is incorrect. The sentence emphasizes one fact that supports the influence theory; it doesn't effectively present the theory to an audience unfamiliar with the Haudenosaunee Confederacy. *Choice D* is incorrect. The sentence makes a broad generalization about Native people's influence on the founding of the US; it doesn't effectively present the influence theory.

## QUESTION 31

**Choice A** is the best answer. Noting that the Sun (9,800°F) is hotter than most stars within 10 parsecs of it, the sentence emphasizes how hot the Sun is relative to nearby stars.

*Choice B* is incorrect. The sentence explains that astronomer Todd Henry determined the classifications for the Sun and several other stars nearby; it doesn't emphasize how hot the Sun is relative to nearby stars. *Choice C* is incorrect. The sentence explains that the majority of stars near the Sun are classified as K or M stars; it doesn't indicate the Sun's temperature or emphasize how hot it is relative to nearby stars. *Choice D* is incorrect. While the sentence indicates that the Sun is classified differently than most nearby stars due to its surface temperature, it doesn't emphasize how hot the Sun is relative to nearby stars.



## QUESTION 32

**Choice A** is the best answer. The sentence effectively introduces Cathryn Halverson's book to an audience already familiar with the *Atlantic Monthly*, noting the title of Halverson's book and describing its content without providing background information about the *Atlantic Monthly*.

**Choice B** is incorrect. The sentence introduces the *Atlantic Monthly* and mentions that it's referred to in Cathryn Halverson's book title; it doesn't effectively introduce Halverson's book. **Choice C** is incorrect. The sentence assumes that the audience is unfamiliar with the *Atlantic Monthly*, providing background information about the magazine; it doesn't effectively introduce Halverson's book to an audience already familiar with the *Atlantic Monthly*. **Choice D** is incorrect. While the sentence assumes that the audience is familiar with the *Atlantic Monthly*, it doesn't effectively introduce Cathryn Halverson's book.

## QUESTION 33

**Choice B** is the best answer. The sentence emphasizes a similarity between the two ways a magnificent frigatebird acquires food, noting that neither way requires the seabird to dive into the water.

**Choice A** is incorrect. The sentence describes how a magnificent frigatebird captures prey without diving into water; it doesn't emphasize a similarity between the two ways the seabird acquires food. **Choice C** is incorrect. The sentence notes the term used to describe one of the two ways that magnificent frigatebirds acquire food; it doesn't emphasize a similarity between the two ways. **Choice D** is incorrect. The sentence describes the two ways that a magnificent frigatebird acquires food; it doesn't emphasize a similarity between the two ways.

# Math

## Module 1 (27 questions)

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### QUESTION 1

**Choice B** is correct. The height of each bar in the bar graph given represents the number of students that voted for the activity specified at the bottom of the bar. The bar for activity 3 has a height that is between 35 and 40. In other words, the number of students that chose activity 3 is between 35 students and 40 students. Of the given choices, 39 is the only value between 35 and 40. Therefore, 39 students chose activity 3.

*Choice A* is incorrect and may result from conceptual errors. *Choice C* is incorrect. This is the number of students that chose activity 5, not activity 3. *Choice D* is incorrect and may result from conceptual errors.

### QUESTION 2

**Choice A** is correct. Let  $x$  represent the percentage of 300 that is 75. This can be written as  $\frac{x}{100}(300) = 75$ , or  $3x = 75$ . Dividing both sides of this equation by 3 yields  $x = 25$ . Therefore, 25% of 300 is 75.

*Choice B* is incorrect. 50% of 300 is 150, not 75. *Choice C* is incorrect. 75% of 300 is 225, not 75. *Choice D* is incorrect. 225% of 300 is 675, not 75.

### QUESTION 3

**Choice B** is correct. Multiplying the left- and right-hand sides of the given equation by 25 yields  $x^2 = 900$ . Taking the square root of the left- and right-hand sides of this equation yields  $x = 30$  or  $x = -30$ . Of these two solutions, only 30 is given as a choice.

*Choice A* is incorrect. This is a solution to the equation  $x^2 = 36$ . *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect and may result from conceptual or calculation errors.

## QUESTION 4

**Choice D** is correct. The given phrase “8 times a number  $x$ ” can be represented by the expression  $8x$ . The given phrase “3 more than” indicates an increase of 3 to a quantity. Therefore “3 more than 8 times a number  $x$ ” can be represented by the expression  $8x + 3$ . Since it’s given that 3 more than 8 times a number  $x$  is equal to 83, it follows that  $8x + 3$  is equal to 83, or  $8x + 3 = 83$ . Therefore, the equation that represents this situation is  $8x + 3 = 83$ .

**Choice A** is incorrect. This equation represents 3 times the quantity 8 times a number  $x$  is equal to 83. **Choice B** is incorrect. This equation represents 8 times a number  $x$  is equal to 3 more than 83. **Choice C** is incorrect. This equation represents 8 more than 3 times a number  $x$  is equal to 83.

## QUESTION 5

**Choice A** is correct. It’s given that  $t$  represents the number of monthly deposits. In the given function  $f(t) = 100 + 25t$ , the coefficient of  $t$  is 25. This means that for every increase in the value of  $t$  by 1, the value of  $f(t)$  increases by 25. It follows that with each monthly deposit, the amount in Hana’s bank account increased by \$25.

**Choice B** is incorrect. Before Hana made any monthly deposits, the amount in her bank account was \$100. **Choice C** is incorrect. After 1 monthly deposit, the amount in Hana’s bank account was \$125. **Choice D** is incorrect and may result from conceptual errors.

## QUESTION 6

The correct answer is 9. It’s given that the customer spent \$27 to purchase oranges at \$3 per pound. Therefore, the number of pounds of oranges the customer purchased is  $\$27 \left( \frac{1 \text{ pound}}{\$3} \right)$ , or 9 pounds.

## QUESTION 7

The correct answer is 10. It’s given that the cost for the entire purchase was \$27 after a coupon was used for \$63 off the entire purchase. Adding the amount of the coupon to the purchase price yields  $27 + 63 = 90$ . Thus, the cost for the entire purchase before using the coupon was \$90. It’s given that Nasir bought 9 storage bins. The original price for 1 storage bin can be found by dividing the total cost by 9. Therefore, the original price, in dollars, for 1 storage bin is  $\frac{90}{9}$ , or 10.

## QUESTION 8

**Choice A** is correct. An equation that defines a linear function  $f$  can be written in the form  $f(x) = mx + b$ , where  $m$  and  $b$  are constants. It’s given in the table that when  $x = 0$ ,  $f(x) = 29$ . Substituting 0 for  $x$  and 29 for  $f(x)$  in the equation  $f(x) = mx + b$  yields  $29 = m(0) + b$ , or  $29 = b$ . Substituting 29 for  $b$  in the equation  $f(x) = mx + b$  yields  $f(x) = mx + 29$ . It’s also given in the table that when  $x = 1$ ,  $f(x) = 32$ . Substituting 1 for  $x$  and 32 for  $f(x)$  in the equation

$f(x) = mx + 29$  yields  $32 = m(1) + 29$ , or  $32 = m + 29$ . Subtracting 29 from both sides of this equation yields  $3 = m$ . Substituting 3 for  $m$  in the equation  $f(x) = mx + 29$  yields  $f(x) = 3x + 29$ .

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

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

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

## QUESTION 9

**Choice B** is correct. In similar triangles, corresponding angles are congruent. It's given that right triangles  $PQR$  and  $STU$  are similar, where angle  $P$  corresponds to angle  $S$ . It follows that angle  $P$  is congruent to angle  $S$ . In the triangles shown, angle  $R$  and angle  $U$  are both marked as right angles, so angle  $R$  and angle  $U$  are corresponding angles. It follows that angle  $Q$  and angle  $T$  are corresponding angles, and thus, angle  $Q$  is congruent to angle  $T$ . It's given that the measure of angle  $Q$  is  $18^\circ$ , so the measure of angle  $T$  is also  $18^\circ$ . Angle  $U$  is a right angle, so the measure of angle  $U$  is  $90^\circ$ . The sum of the measures of the interior angles of a triangle is  $180^\circ$ . Thus, the sum of the measures of the interior angles of triangle  $STU$  is 180 degrees. Let  $s$  represent the measure, in degrees, of angle  $S$ . It follows that  $s + 18 + 90 = 180$ , or  $s + 108 = 180$ . Subtracting 108 from both sides of this equation yields  $s = 72$ . Therefore, if the measure of angle  $Q$  is 18 degrees, then the measure of angle  $S$  is 72 degrees.

*Choice A* is incorrect. This is the measure of angle  $T$ . *Choice C* is incorrect and may result from conceptual or calculation errors. *Choice D* is incorrect. This is the sum of the measures of angle  $S$  and angle  $U$ .

## QUESTION 10

**Choice D** is correct. The data points suggest that as the variable  $x$  increases, the variable  $y$  decreases, which implies that an appropriate linear model for the data has a negative slope. The data points also show that when  $x$  is close to 0,  $y$  is greater than 9. Therefore, the  $y$ -intercept of the graph of an appropriate linear model has a  $y$ -coordinate greater than 9. The graph of an equation of the form  $y = a + bx$ , where  $a$  and  $b$  are constants, has a  $y$ -intercept with a  $y$ -coordinate of  $a$  and has a slope of  $b$ . Of the given choices, only choice D represents a graph that has a negative slope,  $-0.9$ , and a  $y$ -intercept with a  $y$ -coordinate greater than 9, 9.4.

*Choice A* is incorrect. The graph of this equation has a positive slope, not a negative slope, and a  $y$ -intercept with a  $y$ -coordinate less than 1, not greater than 9. *Choice B* is incorrect. The graph of this equation has a  $y$ -intercept with a  $y$ -coordinate less than 1, not greater than 9. *Choice C* is incorrect. The graph of this equation has a positive slope, not a negative slope.

## QUESTION 11

**Choice A** is correct. The number of birds can be found by calculating the value of  $b$  when  $r = 16$  in the given equation. Substituting 16 for  $r$  in the given equation

yields  $2.5b + 5(16) = 80$ , or  $2.5b + 80 = 80$ . Subtracting 80 from both sides of this equation yields  $2.5b = 0$ . Dividing both sides of this equation by 2.5 yields  $b = 0$ . Therefore, if the business cares for 16 reptiles on a given day, it can care for 0 birds on this day.

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

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

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

## QUESTION 12

**Choice C** is correct. An equation of a line can be written in the form  $y = mx + b$ , where  $m$  is the slope of the line and  $(0, b)$  is the  $y$ -intercept of the line. The line shown passes through the point  $(0, -8)$ , so  $b = -8$ . The line shown also passes through the point  $(-8, 0)$ . The slope,  $m$ , of a line passing through two points

$(x_1, y_1)$  and  $(x_2, y_2)$  can be calculated using the equation  $m = \frac{y_2 - y_1}{x_2 - x_1}$ . For the points  $(0, -8)$  and  $(-8, 0)$ , this gives  $m = \frac{(-8) - 0}{0 - (-8)}$ , or  $m = -1$ . Substituting  $-8$  for  $b$  and  $-1$  for  $m$  in  $y = mx + b$  yields  $y = (-1)x + (-8)$ , or  $y = -x - 8$ . Therefore, an equation of the graph shown is  $y = -x - 8$ .

*Choice A* is incorrect. This is an equation of a line with a slope of  $-2$ , not  $-1$ .

*Choice B* is incorrect. This is an equation of a line with a slope of  $1$ , not  $-1$ .

*Choice D* is incorrect. This is an equation of a line with a slope of  $2$ , not  $-1$ .

## QUESTION 13

The correct answer is  $\frac{1}{5}$ . Since the number 5 can also be written as  $\frac{5}{1}$ , the given equation can also be written as  $\frac{x}{8} = \frac{5}{1}$ . This equation is equivalent to  $\frac{8}{x} = \frac{1}{5}$ . Therefore, the value of  $\frac{8}{x}$  is  $\frac{1}{5}$ . Note that  $1/5$  and  $.2$  are examples of ways to enter a correct answer.

Alternate approach: Multiplying both sides of the equation  $\frac{x}{8} = 5$  by 8 yields  $x = 40$ . Substituting 40 for  $x$  into the expression  $\frac{8}{x}$  yields  $\frac{8}{40}$ , or  $\frac{1}{5}$ .

## QUESTION 14

The correct answer is 80. Subtracting the second equation in the given system from the first equation yields  $(24x + y) - (6x + y) = 48 - 72$ , which is equivalent to  $24x - 6x + y - y = -24$ , or  $18x = -24$ . Dividing each side of this equation by 3 yields  $6x = -8$ . Substituting  $-8$  for  $6x$  in the second equation yields  $-8 + y = 72$ . Adding 8 to both sides of this equation yields  $y = 80$ .

Alternate approach: Multiplying each side of the second equation in the given system by 4 yields  $24x + 4y = 288$ . Subtracting the first equation in the given system from this equation yields  $(24x + 4y) - (24x + y) = 288 - 48$ , which is

equivalent to  $24x - 24x + 4y - y = 240$ , or  $3y = 240$ . Dividing each side of this equation by 3 yields  $y = 80$ .

## QUESTION 15

**Choice D** is correct. The equation that defines line  $t$  in the  $xy$ -plane can be written in slope-intercept form  $y = mx + b$ , where  $m$  is the slope of line  $t$  and  $(0, b)$  is its  $y$ -intercept. It's given that line  $t$  has a slope of  $-\frac{1}{3}$ . Therefore,  $m = -\frac{1}{3}$ . Substituting  $-\frac{1}{3}$  for  $m$  in the equation  $y = mx + b$  yields  $y = -\frac{1}{3}x + b$ , or  $y = -\frac{x}{3} + b$ . It's also given that line  $t$  passes through the point  $(9, 10)$ . Substituting 9 for  $x$  and 10 for  $y$  in the equation  $y = -\frac{x}{3} + b$  yields  $10 = -\frac{9}{3} + b$ , or  $10 = -3 + b$ . Adding 3 to both sides of this equation yields  $13 = b$ . Substituting 13 for  $b$  in the equation  $y = -\frac{x}{3} + b$  yields  $y = -\frac{x}{3} + 13$ .

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

**Choice B** is incorrect. This equation defines a line that has a slope of 9, not  $-\frac{1}{3}$ , and passes through the point  $(0, 10)$ , not  $(9, 10)$ . **Choice C** is incorrect. This equation defines a line that passes through the point  $(0, 10)$ , not  $(9, 10)$ .

## QUESTION 16

**Choice B** is correct. It's given that the function  $f(x) = 206(1.034)^x$  models the value, in dollars, of a certain bank account by the end of each year from 1957 through 1972, where  $x$  is the number of years after 1957. It follows that  $f(x)$  represents the estimated value, in dollars, of the bank account  $x$  years after 1957. Since the value of  $f(5)$  is the value of  $f(x)$  when  $x = 5$ , it follows that " $f(5)$  is approximately equal to 243" means that  $f(x)$  is approximately equal to 243 when  $x = 5$ . In the given context, this means that the value of the bank account is estimated to be approximately 243 dollars 5 years after 1957. Therefore, the best interpretation of the statement " $f(5)$  is approximately equal to 243" in this context is the value of the bank account is estimated to be approximately 243 dollars in 1962.

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

## QUESTION 17

**Choice B** is correct. It's given that the ratio of the rectangular region's length to its width is 35 to 10. This can be written as a proportion:  $\frac{\text{length}}{\text{width}} = \frac{35}{10}$ , or  $\frac{\ell}{w} = \frac{35}{10}$ . This proportion can be rewritten as  $10\ell = 35w$ , or  $\ell = 3.5w$ . If the width of the rectangular region increases by 7, then the length will increase by some number  $x$  in order to maintain this ratio. The value of  $x$  can be found by replacing  $\ell$  with  $\ell + x$  and  $w$  with  $w + 7$  in the equation, which gives  $\ell + x = 3.5(w + 7)$ . This equation can be rewritten using the distributive property as  $\ell + x = 3.5w + 24.5$ .

Since  $\ell = 3.5w$ , the right-hand side of this equation can be rewritten by substituting  $\ell$  for  $3.5w$ , which gives  $\ell + x = \ell + 24.5$ , or  $x = 24.5$ . Therefore, if the width of the rectangular region increases by 7 units, the length must increase by 24.5 units in order to maintain the given ratio.

*Choice A* is incorrect. If the width of the rectangular region increases, the length must also increase, not decrease. *Choice C* is incorrect. If the width of the rectangular region increases, the length must also increase, not decrease. *Choice D* is incorrect. Since the ratio of the length to the width of the rectangular region is 35 to 10, if the width of the rectangular region increases by 7 units, the length would have to increase by a proportional amount, which would have to be greater than 7 units.

## QUESTION 18

**Choice A** is correct. Let  $x$  represent the side length, in inches, of square P. It follows that the perimeter of square P is  $4x$  inches. It's given that square Q has a perimeter that is 176 inches greater than the perimeter of square P. Thus, the perimeter of square Q is 176 inches greater than  $4x$  inches, or  $4x + 176$  inches. Since the perimeter of a square is 4 times the side length of the square, each side length of Q is  $\frac{4x+176}{4}$ , or  $x + 44$  inches. Since the area of a square is calculated by multiplying the length of two sides, the area of square Q is  $(x + 44)(x + 44)$ , or  $(x + 44)^2$  square inches. It follows that function  $f$  is defined by  $f(x) = (x + 44)^2$ .

*Choice B* is incorrect. This function represents a square with side lengths  $(x + 176)$  inches. *Choice C* is incorrect. This function represents a square with side lengths  $(176x + 44)$  inches. *Choice D* is incorrect. This function represents a square with side lengths  $(176x + 176)$  inches.

## QUESTION 19

**Choice C** is correct. Dividing each side of the given equation by 2 yields

$\frac{14x}{14y} = \frac{2\sqrt{w+19}}{2}$ , or  $\frac{x}{y} = \sqrt{w+19}$ . Because it's given that each of the variables is positive, squaring each side of this equation yields the equivalent equation  $\left(\frac{x}{y}\right)^2 = w + 19$ . Subtracting 19 from each side of this equation yields  $\left(\frac{x}{y}\right)^2 - 19 = w$ , or  $w = \left(\frac{x}{y}\right)^2 - 19$ .

*Choice A* is incorrect. This equation isn't equivalent to the given equation.

*Choice B* is incorrect. This equation isn't equivalent to the given equation.

*Choice D* is incorrect. This equation isn't equivalent to the given equation.

## QUESTION 20

The correct answer is 100. It's given that point  $O$  is the center of a circle and the measure of arc  $RS$  on the circle is  $100^\circ$ . It follows that points  $R$  and  $S$  lie on the circle. Therefore,  $OR$  and  $OS$  are radii of the circle. A central angle is an angle

formed by two radii of a circle, with its vertex at the center of the circle. Therefore,  $\angle ROS$  is a central angle. Because the degree measure of an arc is equal to the measure of its associated central angle, it follows that the measure, in degrees, of  $\angle ROS$  is 100.

## QUESTION 21

The correct answer is  $\frac{361}{8}$ . The rational exponent property is  $\sqrt[n]{y^m} = y^{\frac{m}{n}}$ , where  $y > 0$ ,  $m$  and  $n$  are integers, and  $n > 0$ . This property can be applied to rewrite the given expression  $6\sqrt[5]{3^5 x^{45}} \cdot \sqrt[8]{2^8 x}$  as  $6\left(3^{\frac{5}{5}}\right)\left(x^{\frac{45}{5}}\right)\left(2^{\frac{8}{8}}\right)\left(x^{\frac{1}{8}}\right)$ , or  $6(3)(x^9)(2)\left(x^{\frac{1}{8}}\right)$ .

This expression can be rewritten by multiplying the constants, which gives  $36(x^9)\left(x^{\frac{1}{8}}\right)$ . The multiplication exponent property is  $y^n \cdot y^m = y^{n+m}$ , where  $y > 0$ .

This property can be applied to rewrite the expression  $36(x^9)\left(x^{\frac{1}{8}}\right)$  as  $36x^{9+\frac{1}{8}}$ , or  $36x^{\frac{73}{8}}$ . Therefore,  $6\sqrt[5]{3^5 x^{45}} \cdot \sqrt[8]{2^8 x} = 36x^{\frac{73}{8}}$ . It's given that  $6\sqrt[5]{3^5 x^{45}} \cdot \sqrt[8]{2^8 x}$  is equivalent to  $ax^b$ ; therefore,  $a = 36$  and  $b = \frac{73}{8}$ . It follows that  $a + b = 36 + \frac{73}{8}$ .

Finding a common denominator on the right-hand side of this equation gives

$a + b = \frac{288}{8} + \frac{73}{8}$ , or  $a + b = \frac{361}{8}$ . Note that 361/8, 45.12, and 45.13 are examples of ways to enter a correct answer.

## QUESTION 22

**Choice B** is correct. The area,  $A$ , of a triangle can be found using the formula  $A = \frac{1}{2}bh$ , where  $b$  is the length of the base of the triangle and  $h$  is the height of the triangle. It's given that the triangle is a right triangle. Therefore, its base and height can be represented by the two legs. It's also given that the triangle has sides of length  $2\sqrt{2}$ ,  $6\sqrt{2}$ , and  $\sqrt{80}$  units. Since  $\sqrt{80}$  units is the greatest of these lengths, it's the length of the hypotenuse. Therefore, the two legs have lengths  $2\sqrt{2}$  and  $6\sqrt{2}$  units. Substituting these values for  $b$  and  $h$  in the formula  $A = \frac{1}{2}bh$  gives  $A = \frac{1}{2}(2\sqrt{2})(6\sqrt{2})$ , which is equivalent to  $A = 6\sqrt{4}$  square units, or  $A = 12$  square units.

**Choice A** is incorrect. This expression represents the perimeter, rather than the area, of the triangle. **Choice C** is incorrect and may result from conceptual or calculation errors. **Choice D** is incorrect and may result from conceptual or calculation errors.

## QUESTION 23

**Choice D** is correct. It's given that  $4x^2 + bx - 45$  can be rewritten as  $(hx + k)(x + j)$ . The expression  $(hx + k)(x + j)$  can be rewritten as  $hx^2 + jhx + kx + kj$ , or  $hx^2 + (jh + k)x + kj$ . Therefore,  $hx^2 + (jh + k)x + kj$  is equivalent to  $4x^2 + bx - 45$ . It follows that  $kj = -45$ . Dividing each side of this equation by  $k$  yields  $j = \frac{-45}{k}$ . Since  $j$  is an integer,  $-\frac{45}{k}$  must be an integer. Therefore,  $\frac{45}{k}$  must also be an integer.



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

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

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

## QUESTION 24

**Choice C** is correct. It's given that the graphs of the equations in the given system intersect at exactly one point,  $(x, y)$ , in the  $xy$ -plane. Therefore,  $(x, y)$  is the only solution to the given system of equations. The given system of equations can be solved by subtracting the second equation,  $y = 3x + a$ , from the first equation,  $y = 2x^2 - 21x + 64$ . This yields  $y - y = (2x^2 - 21x + 64) - (3x + a)$ , or  $0 = 2x^2 - 24x + 64 - a$ . Since the given system has only one solution, this equation has only one solution. A quadratic equation in the form  $rx^2 + sx + t = 0$ , where  $r$ ,  $s$ , and  $t$  are constants, has one solution if and only if the discriminant,  $s^2 - 4rt$ , is equal to zero. Substituting 2 for  $r$ ,  $-24$  for  $s$ , and  $-a + 64$  for  $t$  in the expression  $s^2 - 4rt$  yields  $(-24)^2 - (4)(2)(64 - a)$ . Setting this expression equal to zero yields  $(-24)^2 - (4)(2)(64 - a) = 0$ , or  $8a + 64 = 0$ . Subtracting 64 from both sides of this equation yields  $8a = -64$ . Dividing both sides of this equation by 8 yields  $a = -8$ . Substituting  $-8$  for  $a$  in the equation  $0 = 2x^2 - 24x + 64 - a$  yields  $0 = 2x^2 - 24x + 64 + 8$ , or  $0 = 2x^2 - 24x + 72$ . Factoring 2 from the right-hand side of this equation yields  $0 = 2(x^2 - 12x + 36)$ . Dividing both sides of this equation by 2 yields  $0 = x^2 - 12x + 36$ , which is equivalent to  $0 = (x - 6)(x - 6)$ , or  $0 = (x - 6)^2$ . Taking the square root of both sides of this equation yields  $0 = x - 6$ . Adding 6 to both sides of this equation yields  $x = 6$ .

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

## QUESTION 25

**Choice C** is correct. Since the triangle is an isosceles right triangle, the two sides that form the right angle must be the same length. Let  $x$  be the length, in inches, of each of those sides. The Pythagorean theorem states that in a right triangle,  $a^2 + b^2 = c^2$ , where  $c$  is the length of the hypotenuse and  $a$  and  $b$  are the lengths of the other two sides. Substituting  $x$  for  $a$ ,  $x$  for  $b$ , and 58 for  $c$  in this equation yields  $x^2 + x^2 = 58^2$ , or  $2x^2 = 58^2$ . Dividing each side of this equation by 2 yields  $x^2 = \frac{58^2}{2}$ , or  $x^2 = \frac{2 \cdot 58^2}{4}$ . Taking the square root of each side of this equation yields two solutions:  $x = \frac{58\sqrt{2}}{2}$  and  $x = -\frac{58\sqrt{2}}{2}$ . The value of  $x$  must be positive because it represents a side length. Therefore,  $x = \frac{58\sqrt{2}}{2}$ , or  $x = 29\sqrt{2}$ . The perimeter, in inches, of the triangle is  $58 + x + x$ , or  $58 + 2x$ . Substituting  $29\sqrt{2}$  for  $x$  in this expression gives a perimeter, in inches, of  $58 + 2(29\sqrt{2})$ , or  $58 + 58\sqrt{2}$ .

*Choice A* is incorrect. This is the length, in inches, of each of the congruent sides of the triangle, not the perimeter, in inches, of the triangle. *Choice B* is incorrect. This is the sum of the lengths, in inches, of the congruent sides of the triangle, not

the perimeter, in inches, of the triangle. *Choice D* is incorrect and may result from conceptual or calculation errors.

## QUESTION 26

**Choice D** is correct. The equation of a parabola in the  $xy$ -plane can be written in the form  $y = a(x - h)^2 + k$ , where  $a$  is a constant and  $(h, k)$  is the vertex of the parabola. If  $a$  is positive, the parabola will open upward, and if  $a$  is negative, the parabola will open downward. It's given that the parabola has vertex  $(9, -14)$ . Substituting 9 for  $h$  and  $-14$  for  $k$  in the equation  $y = a(x - h)^2 + k$  gives  $y = a(x - 9)^2 - 14$ , which can be rewritten as  $y = a(x - 9)(x - 9) - 14$ , or  $y = a(x^2 - 18x + 81) - 14$ . Distributing the factor of  $a$  on the right-hand side of this equation yields  $y = ax^2 - 18ax + 81a - 14$ . Therefore, the equation of the parabola,  $y = ax^2 - 18ax + 81a - 14$ , can be written in the form  $y = ax^2 + bx + c$ , where  $a = a$ ,  $b = -18a$ , and  $c = 81a - 14$ . Substituting  $-18a$  for  $b$  and  $81a - 14$  for  $c$  in the expression  $a + b + c$  yields  $(a) + (-18a) + (81a - 14)$ , or  $64a - 14$ . Since the vertex of the parabola,  $(9, -14)$ , is below the  $x$ -axis, and it's given that the parabola intersects the  $x$ -axis at two points, the parabola must open upward. Therefore, the constant  $a$  must have a positive value. Setting the expression  $64a - 14$  equal to the value in choice D yields  $64a - 14 = -12$ . Adding 14 to both sides of this equation yields  $64a = 2$ . Dividing both sides of this equation by 64 yields  $a = \frac{2}{64}$ , which is a positive value. Therefore, if the equation of the parabola is written in the form  $y = ax^2 + bx + c$ , where  $a$ ,  $b$ , and  $c$  are constants, the value of  $a + b + c$  could be  $-12$ .

*Choice A* is incorrect. If the equation of a parabola with a vertex at  $(9, -14)$  is written in the form  $y = ax^2 + bx + c$ , where  $a$ ,  $b$ , and  $c$  are constants and  $a + b + c = -23$ , then the value of  $a$  will be negative, which means the parabola will open downward, not upward, and will intersect the  $x$ -axis at zero points, not two points. *Choice B* is incorrect. If the equation of a parabola with a vertex at  $(9, -14)$  is written in the form  $y = ax^2 + bx + c$ , where  $a$ ,  $b$ , and  $c$  are constants and  $a + b + c = -19$ , then the value of  $a$  will be negative, which means the parabola will open downward, not upward, and will intersect the  $x$ -axis at zero points, not two points. *Choice C* is incorrect. If the equation of a parabola with a vertex at  $(9, -14)$  is written in the form  $y = ax^2 + bx + c$ , where  $a$ ,  $b$ , and  $c$  are constants and  $a + b + c = -14$ , then the value of  $a$  will be 0, which is inconsistent with the equation of a parabola.

**QUESTION 27**

The correct answer is 5. It's given that  $f(x) = -a^x + b$ . Substituting  $-a^x + b$  for  $f(x)$  in the equation  $y = f(x) - 15$  yields  $y = -a^x + b - 15$ . It's given that the  $y$ -intercept of the graph of  $y = f(x) - 15$  is  $(0, -\frac{99}{7})$ . Substituting 0 for  $x$  and  $-\frac{99}{7}$  for  $y$  in the equation  $y = -a^x + b - 15$  yields  $-\frac{99}{7} = -a^0 + b - 15$ , which is equivalent to  $-\frac{99}{7} = -1 + b - 15$ , or  $-\frac{99}{7} = b - 16$ . Adding 16 to both sides of this equation yields  $\frac{13}{7} = b$ . It's given that the product of  $a$  and  $b$  is  $\frac{65}{7}$ , or  $ab = \frac{65}{7}$ . Substituting  $\frac{13}{7}$  for  $b$  in this equation yields  $(a)(\frac{13}{7}) = \frac{65}{7}$ . Dividing both sides of this equation by  $\frac{13}{7}$  yields  $a = 5$ .

# Math

## Module 2

(27 questions)

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### QUESTION 1

**Choice B** is correct. For the given line graph, the estimated number of chipmunks is represented on the vertical axis. The greatest estimated number of chipmunks in the state park is indicated by the greatest height in the line graph. This height is achieved when the year is 1994.

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

### QUESTION 2

**Choice B** is correct. It's given that the fish swam 5,104 yards and that 1 mile is equal to 1,760 yards. Therefore, the fish swam 5,104 yards  $\left(\frac{1 \text{ mile}}{1,760 \text{ yards}}\right)$ , which is equivalent to  $\frac{5,104}{1,760}$  miles, or 2.9 miles.

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

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

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

### QUESTION 3

**Choice C** is correct. The given expression shows subtraction of two like terms. The two terms can be subtracted as follows:  $12x^3 - 5x^3 = (12 - 5)x^3$ , or  $7x^3$ .

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

*Choice B* is incorrect. This is the result of adding, not subtracting, the two like terms. *Choice D* is incorrect and may result from conceptual or calculation errors.

## QUESTION 4

**Choice A** is correct. The second equation in the given system defines the value of  $x$  as  $5y$ . Substituting  $5y$  for  $x$  into the first equation yields  $5y + y = 18$  or  $6y = 18$ . Dividing each side of this equation by 6 yields  $y = 3$ . Substituting 3 for  $y$  in the second equation yields  $5(3) = x$  or  $x = 15$ . Therefore, the solution  $(x, y)$  to the given system of equations is  $(15, 3)$ .

**Choice B** is incorrect. Substituting 16 for  $x$  and 2 for  $y$  in the second equation yields  $5(2) = 16$ , which is not true. Therefore,  $(16, 2)$  is not a solution to the given system of equations. **Choice C** is incorrect. Substituting 17 for  $x$  and 1 for  $y$  in the second equation yields  $5(1) = 17$ , which is not true. Therefore,  $(17, 1)$  is not a solution to the given system of equations. **Choice D** is incorrect. Substituting 18 for  $x$  and 0 for  $y$  in the second equation yields  $5(0) = 18$ , which is not true. Therefore,  $(18, 0)$  is not a solution to the given system of equations.

## QUESTION 5

**Choice A** is correct. The given point,  $(8, 2)$ , is located in the first quadrant in the  $xy$ -plane. The system of inequalities in choice A represents all the points in the first quadrant in the  $xy$ -plane. Therefore,  $(8, 2)$  is a solution to the system of inequalities in choice A.

Alternate approach: Substituting 8 for  $x$  in the first inequality in choice A,  $x > 0$ , yields  $8 > 0$ , which is true. Substituting 2 for  $y$  in the second inequality in choice A,  $y > 0$ , yields  $2 > 0$ , which is true. Since the coordinates of the point  $(8, 2)$  make the inequalities  $x > 0$  and  $y > 0$  true, the point  $(8, 2)$  is a solution to the system of inequalities consisting of  $x > 0$  and  $y > 0$ .

**Choice B** is incorrect. This system of inequalities represents all the points in the fourth quadrant, not the first quadrant, in the  $xy$ -plane. **Choice C** is incorrect. This system of inequalities represents all the points in the second quadrant, not the first quadrant, in the  $xy$ -plane. **Choice D** is incorrect. This system of inequalities represents all the points in the third quadrant, not the first quadrant, in the  $xy$ -plane.

## QUESTION 6

The correct answer is 15 or  $-5$ . By the definition of absolute value, if  $|x - 5| = 10$ , then  $x - 5 = 10$  or  $x - 5 = -10$ . Adding 5 to both sides of the first equation yields  $x = 15$ . Adding 5 to both sides of the second equation yields  $x = -5$ . Thus, the given equation has two possible solutions, 15 and  $-5$ . Note that 15 and  $-5$  are examples of ways to enter a correct answer.

## QUESTION 7

The correct answer is 50. It's given that the function  $f$  gives the total number of people on a company retreat with  $x$  managers. It's also given that 7 managers are on the company retreat. Substituting 7 for  $x$  in the given function yields  $f(7) = 7(7) + 1$ , or  $f(7) = 50$ . Therefore, there are a total of 50 people on a company retreat with 7 managers.

## QUESTION 8

**Choice B** is correct. It's given that  $h(x) = x^2 - 3$ . Each table gives 1, 2, and 3 as the three given values of  $x$ . Substituting 1 for  $x$  in the equation  $h(x) = x^2 - 3$  yields  $h(1) = (1)^2 - 3$ , or  $h(1) = -2$ . Substituting 2 for  $x$  in the equation  $h(x) = x^2 - 3$  yields  $h(2) = (2)^2 - 3$ , or  $h(2) = 1$ . Finally, substituting 3 for  $x$  in the equation  $h(x) = x^2 - 3$  yields  $h(3) = (3)^2 - 3$ , or  $h(3) = 6$ . Therefore,  $h(x)$  is  $-2$  when  $x$  is 1,  $h(x)$  is 1 when  $x$  is 2, and  $h(x)$  is 6 when  $x$  is 3. Choice B is a table with these values of  $x$  and their corresponding values of  $h(x)$ .

**Choice A** is incorrect. This is a table of values for the function  $h(x) = x + 3$ , not  $h(x) = x^2 - 3$ . **Choice C** is incorrect. This is a table of values for the function  $h(x) = 2x - 3$ , not  $h(x) = x^2 - 3$ . **Choice D** is incorrect and may result from conceptual or calculation errors.

## QUESTION 9

**Choice D** is correct. The value of  $f(0)$  is the value of  $f(x)$  when  $x = 0$ . Substituting 0 for  $x$  in the given function yields  $f(0) = 270(0.1)^0$ , or  $f(0) = 270(1)$ , which is equivalent to  $f(0) = 270$ . Therefore, the value of  $f(0)$  is 270.

**Choice A** is incorrect. This is the value of  $x$ , not  $f(x)$ . **Choice B** is incorrect and may result from conceptual or calculation errors. **Choice C** is incorrect. This is the value of  $f(1)$ , not  $f(0)$ .

## QUESTION 10

**Choice A** is correct. It's given that the estimate for the proportion of the population that has the characteristic is 0.49 with an associated margin of error of 0.04. Subtracting the margin of error from the estimate and adding the margin of error to the estimate gives an interval of plausible values for the true proportion of the population that has the characteristic. Therefore, it's plausible that the proportion of the population that has this characteristic is between 0.45 and 0.53.

**Choice B** is incorrect. A value less than 0.45 is outside the interval of plausible values for the proportion of the population that has the characteristic. **Choice C** is incorrect. The value 0.49 is an estimate for the proportion based on this sample. However, since the margin of error for this estimate is known, the most appropriate conclusion is not that the proportion is exactly one value but instead lies in an interval of plausible values. **Choice D** is incorrect. A value greater than 0.53 is outside the interval of plausible values for the proportion of the population that has the characteristic.

## QUESTION 11

**Choice A** is correct. It's given that the truck can tow a trailer if the combined weight of the trailer and the boxes it contains is no more than 4,600 pounds. If the trailer has a weight of 500 pounds and each box weighs 120 pounds, the

expression  $500 + 120b$ , where  $b$  is the number of boxes, gives the combined weight of the trailer and the boxes. Since the combined weight must be no more than 4,600 pounds, the possible numbers of boxes the truck can tow are given by the inequality  $500 + 120b \leq 4,600$ . Subtracting 500 from both sides of this inequality yields  $120b \leq 4,100$ . Dividing both sides of this inequality by 120 yields  $b \leq \frac{205}{6}$ , or  $b$  is less than or equal to approximately 34.17. Since the number of boxes,  $b$ , must be a whole number, the maximum number of boxes the truck can tow is the greatest whole number less than 34.17, which is 34.

*Choice B* is incorrect. Towing the trailer and 35 boxes would yield a combined weight of 4,700 pounds, which is greater than 4,600 pounds. *Choice C* is incorrect. Towing the trailer and 38 boxes would yield a combined weight of 5,060 pounds, which is greater than 4,600 pounds. *Choice D* is incorrect. Towing the trailer and 39 boxes would yield a combined weight of 5,180 pounds, which is greater than 4,600 pounds.

## QUESTION 12

**Choice B** is correct. Multiplying each side of the given equation by  $-16$  yields  $64x^2 + 112x = 576$ . To complete the square, adding 49 to each side of this equation yields  $64x^2 + 112x + 49 = 576 + 49$ , or  $(8x + 7)^2 = 625$ . Taking the square root of each side of this equation yields two equations:  $8x + 7 = 25$  and  $8x + 7 = -25$ . Subtracting 7 from each side of the equation  $8x + 7 = 25$  yields  $8x = 18$ . Dividing each side of this equation by 8 yields  $x = \frac{18}{8}$ , or  $x = \frac{9}{4}$ . Therefore,  $\frac{9}{4}$  is a solution to the given equation. Subtracting 7 from each side of the equation  $8x + 7 = -25$  yields  $8x = -32$ . Dividing each side of this equation by 8 yields  $x = -4$ . Therefore, the given equation has two solutions,  $\frac{9}{4}$  and  $-4$ . Since  $\frac{9}{4}$  is positive, it follows that  $\frac{9}{4}$  is the positive solution to the given equation.

Alternate approach: Adding  $4x^2$  and  $7x$  to each side of the given equation yields  $0 = 4x^2 + 7x - 36$ . The right-hand side of this equation can be rewritten as  $4x^2 + 16x - 9x - 36$ . Factoring out the common factor of  $4x$  from the first two terms of this expression and the common factor of  $-9$  from the second two terms yields  $4x(x + 4) - 9(x + 4)$ . Factoring out the common factor of  $(x + 4)$  from these two terms yields the expression  $(4x - 9)(x + 4)$ . Since this expression is equal to 0, it follows that either  $4x - 9 = 0$  or  $x + 4 = 0$ . Adding 9 to each side of the equation  $4x - 9 = 0$  yields  $4x = 9$ . Dividing each side of this equation by 4 yields  $x = \frac{9}{4}$ . Therefore,  $\frac{9}{4}$  is a positive solution to the given equation. Subtracting 4 from each side of the equation  $x + 4 = 0$  yields  $x = -4$ . Therefore, the given equation has two solutions,  $\frac{9}{4}$  and  $-4$ . Since  $\frac{9}{4}$  is positive, it follows that  $\frac{9}{4}$  is the positive solution to the given equation.

*Choice A* is incorrect. Substituting  $\frac{7}{4}$  for  $x$  in the given equation yields  $-\frac{49}{2} = -36$ , which is false. *Choice C* is incorrect. Substituting 4 for  $x$  in the given equation yields  $-92 = -36$ , which is false. *Choice D* is incorrect. Substituting 7 for  $x$  in the given equation yields  $-245 = -36$ , which is false.

### QUESTION 13

The correct answer is  $\frac{3}{10}$ . It's given that there are a total of 100 tiles of equal area, which is the total number of possible outcomes. According to the table, there are a total of 30 red tiles. The probability of an event occurring is the ratio of the number of favorable outcomes to the total number of possible outcomes. By definition, the probability of selecting a red tile is given by  $\frac{30}{100}$ , or  $\frac{3}{10}$ . Note that  $\frac{3}{10}$  and .3 are examples of ways to enter a correct answer.

### QUESTION 14

The correct answer is 2. It's given that function  $f$  is defined by  $f(x) = 2x + 3$ . Therefore, the equation representing the graph of  $y = f(x)$  in the  $xy$ -plane is  $y = 2x + 3$ , and the graph is a line. For a linear equation in the form  $y = mx + b$ ,  $m$  represents the slope of the line. Since the value of  $m$  in the equation  $y = 2x + 3$  is 2, the slope of the line defined by function  $f$  is 2. It's given that line  $j$  is parallel to the line defined by function  $f$ . The slopes of parallel lines are equal. Therefore, the slope of line  $j$  is also 2.

### QUESTION 15

**Choice A** is correct. It's given that a radio show stated that 3 times as many people voted in favor of the proposal as people who voted against it. Let  $x$  represent the number of people who voted against the proposal. It follows that  $3x$  is the number of people who voted in favor of the proposal and  $3x - x$ , or  $2x$ , is how many more people voted in favor of the proposal than voted against it. It's also given that a social media post reported that 15,000 more people voted in favor of the proposal than voted against it. Thus,  $2x = 15,000$ . Since  $2x = 15,000$ , the value of  $x$  must be half of 15,000, or 7,500. Therefore, 7,500 people voted against the proposal.

**Choice B** is incorrect. This is how many more people voted in favor of the proposal than voted against it, not the number of people who voted against the proposal.

**Choice C** is incorrect. This is the number of people who voted in favor of the proposal, not the number of people who voted against the proposal. **Choice D** is incorrect and may result from conceptual or calculation errors.

### QUESTION 16

**Choice C** is correct. Vertical angles, which are angles that are opposite each other when two lines intersect, are congruent. The figure shows that lines  $t$  and  $m$  intersect. It follows that the angle with measure  $x^\circ$  and the angle with measure  $y^\circ$  are vertical angles, so  $x = y$ . It's given that  $x = 6k + 13$  and  $y = 8k - 29$ . Substituting  $6k + 13$  for  $x$  and  $8k - 29$  for  $y$  in the equation  $x = y$  yields  $6k + 13 = 8k - 29$ . Subtracting  $6k$  from both sides of this equation yields  $13 = 2k - 29$ . Adding 29 to both sides of this equation yields  $42 = 2k$ , or  $2k = 42$ . Dividing both sides of this equation by 2 yields  $k = 21$ . It's given that lines  $m$  and  $n$  are parallel, and the figure shows that lines  $m$  and  $n$  are intersected by a transversal, line  $t$ . If two parallel lines are intersected by a transversal, then the same-side interior angles are supplementary. It follows that the same-side interior



angles with measures  $y^\circ$  and  $z^\circ$  are supplementary, so  $y + z = 180$ . Substituting  $8k - 29$  for  $y$  in this equation yields  $8k - 29 + z = 180$ . Substituting 21 for  $k$  in this equation yields  $8(21) - 29 + z = 180$ , or  $139 + z = 180$ . Subtracting 139 from both sides of this equation yields  $z = 41$ . Therefore, the value of  $z$  is 41.

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

*Choice B* is incorrect. This is the value of  $k$ , not  $z$ . *Choice D* is incorrect. This is the value of  $x$  or  $y$ , not  $z$ .

## QUESTION 17

**Choice B** is correct. A linear equation in one variable has no solution if and only if the equation is false; that is, when there is no value of  $x$  that produces a true statement. It's given that in the equation  $-3x + 21px = 84$ ,  $p$  is a constant and the equation has no solution for  $x$ . Therefore, the value of the constant  $p$  is one that results in a false equation. Factoring out the common factor of  $-3x$  on the left-hand side of the given equation yields  $-3x(1 - 7p) = 84$ . Dividing both sides of this equation by  $-3$  yields  $x(1 - 7p) = -28$ . Dividing both sides of this equation by  $(1 - 7p)$  yields  $x = \frac{-28}{1 - 7p}$ . This equation is false if and only if  $1 - 7p = 0$ . Adding  $7p$  to both sides of  $1 - 7p = 0$  yields  $1 = 7p$ . Dividing both sides of this equation by 7 yields  $\frac{1}{7} = p$ . It follows that the equation  $x = \frac{-28}{1 - 7p}$  is false if and only if  $p = \frac{1}{7}$ . Therefore, the given equation has no solution if and only if the value of  $p$  is  $\frac{1}{7}$ .

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

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

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

## QUESTION 18

**Choice D** is correct. It's given that  $f(x) = (x - 10)(x + 13)$ , which can be rewritten as  $f(x) = x^2 + 3x - 130$ . Since the coefficient of the  $x^2$ -term is positive, the graph of  $y = f(x)$  in the  $xy$ -plane opens upward and reaches its minimum value at its vertex. The  $x$ -coordinate of the vertex is the value of  $x$  such that  $f(x)$  reaches its minimum. For an equation in the form  $f(x) = ax^2 + bx + c$ , where  $a$ ,  $b$ , and  $c$  are constants, the  $x$ -coordinate of the vertex is  $-\frac{b}{2a}$ . For the equation  $f(x) = x^2 + 3x - 130$ ,  $a = 1$ ,  $b = 3$ , and  $c = -130$ . It follows that the  $x$ -coordinate of the vertex is  $-\frac{3}{2(1)}$ , or  $-\frac{3}{2}$ . Therefore,  $f(x)$  reaches its minimum when the value of  $x$  is  $-\frac{3}{2}$ .

Alternate approach: The value of  $x$  for the vertex of a parabola is the  $x$ -value of the midpoint between the two  $x$ -intercepts of the parabola. Since it's given that  $f(x) = (x - 10)(x + 13)$ , it follows that the two  $x$ -intercepts of the graph of  $y = f(x)$  in the  $xy$ -plane occur when  $x = 10$  and  $x = -13$ , or at the points  $(10, 0)$  and  $(-13, 0)$ . The midpoint between two points,  $(x_1, y_1)$  and  $(x_2, y_2)$ , is  $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ . Therefore, the midpoint between  $(10, 0)$  and  $(-13, 0)$  is  $\left(\frac{10 + (-13)}{2}, \frac{0 + 0}{2}\right)$ , or  $\left(-\frac{3}{2}, 0\right)$ . It follows that  $f(x)$  reaches its minimum when the value of  $x$  is  $-\frac{3}{2}$ .

*Choice A* is incorrect. This is the  $y$ -coordinate of the  $y$ -intercept of the graph of  $y = f(x)$  in the  $xy$ -plane. *Choice B* is incorrect. This is one of the  $x$ -coordinates of the  $x$ -intercepts of the graph of  $y = f(x)$  in the  $xy$ -plane. *Choice C* is incorrect and may result from conceptual or calculation errors.

## QUESTION 19

**Choice A** is correct. The graph of a quadratic equation in the form  $y = a(x - h)^2 + k$ , where  $a$ ,  $h$ , and  $k$  are positive constants, is a parabola that opens upward with vertex  $(h, k)$ . The given function  $f(x) = \frac{1}{9}(x - 7)^2 + 3$  is in the form  $y = a(x - h)^2 + k$ , where  $y = f(x)$ ,  $a = \frac{1}{9}$ ,  $h = 7$ , and  $k = 3$ . Therefore, the graph of  $y = f(x)$  is a parabola that opens upward with vertex  $(7, 3)$ . Since the parabola opens upward, the vertex is the lowest point on the graph. It follows that the  $y$ -coordinate of the vertex of the graph of  $y = f(x)$  is the minimum value of  $f(x)$ . Therefore, the minimum value of  $f(x)$  is 3. It's given that  $f(x) = \frac{1}{9}(x - 7)^2 + 3$  represents the metal ball's height above the ground, in inches,  $x$  seconds after it started moving on a track. Therefore, the best interpretation of the vertex of the graph of  $y = f(x)$  is that the metal ball's minimum height was 3 inches above the ground.

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

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

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

## QUESTION 20

The correct answer is  $\frac{15}{17}$ . It's given that angle  $J$  is the right angle in triangle  $JKL$ . Therefore, the acute angles of triangle  $JKL$  are angle  $K$  and angle  $L$ . The hypotenuse of a right triangle is the side opposite its right angle. Therefore, the hypotenuse of triangle  $JKL$  is side  $KL$ . The cosine of an acute angle in a right triangle is the ratio of the length of the side adjacent to the angle to the length of the hypotenuse. It's given that  $\cos(K) = \frac{24}{51}$ . This can be written as  $\cos(K) = \frac{8}{17}$ . Since the cosine of angle  $K$  is a ratio, it follows that the length of the side adjacent to angle  $K$  is  $8n$  and the length of the hypotenuse is  $17n$ , where  $n$  is a constant. Therefore,  $JK = 8n$  and  $KL = 17n$ . The Pythagorean theorem states that in a right triangle, the square of the length of the hypotenuse is equal to the sum of the squares of the lengths of the other two sides. For triangle  $JKL$ , it follows that  $(JK)^2 + (JL)^2 = (KL)^2$ . Substituting  $8n$  for  $JK$  and  $17n$  for  $KL$  yields  $(8n)^2 + (JL)^2 = (17n)^2$ . This is equivalent to  $64n^2 + (JL)^2 = 289n^2$ . Subtracting  $64n^2$  from each side of this equation yields  $(JL)^2 = 225n^2$ . Taking the square root of each side of this equation yields  $JL = 15n$ . Since  $\cos(L) = \frac{JL}{KL}$ , it follows that  $\cos(L) = \frac{15n}{17n}$ , which can be rewritten as  $\cos(L) = \frac{15}{17}$ . Note that  $15/17$ ,  $.8824$ ,  $.8823$ , and  $0.882$  are examples of ways to enter a correct answer.

## QUESTION 21

The correct answer is 51. A quadratic equation of the form  $ax^2 + bx + c = 0$ , where  $a$ ,  $b$ , and  $c$  are constants, has no real solution if and only if its discriminant,  $-4ac + b^2$ , is negative. In the given equation,  $a = -1$  and  $c = -676$ . Substituting  $-1$  for  $a$  and  $-676$  for  $c$  in this expression yields a discriminant of  $b^2 - 4(-1)(-676)$ , or  $b^2 - 2,704$ . Since this value must be negative,  $b^2 - 2,704 < 0$ , or  $b^2 < 2,704$ . Taking the positive square root of each side of this inequality yields  $b < 52$ . Since  $b$  is a positive integer, and the greatest integer less than 52 is 51, the greatest possible value of  $b$  is 51.

## QUESTION 22

**Choice A** is correct. A solution to a system of equations must satisfy each equation in the system. It follows that if an ordered pair  $(x, y)$  is a solution to the system, the point  $(x, y)$  lies on the graph in the  $xy$ -plane of each equation in the system. The only point that lies on each graph of the system of two linear equations shown is their intersection point  $(8, 2)$ . It follows that if a new graph of three linear equations is created using the system of equations shown and the graph of  $x + 4y = -16$ , this system has either zero solutions or one solution, the point  $(8, 2)$ . Substituting 8 for  $x$  and 2 for  $y$  in the equation  $x + 4y = -16$  yields  $8 + 4(2) = -16$ , or  $16 = -16$ . Since this equation is not true, the point  $(8, 2)$  does not lie on the graph of  $x + 4y = -16$ . Therefore,  $(8, 2)$  is not a solution to the system of three equations. It follows that there are zero solutions to this system.

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

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

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

## QUESTION 23

**Choice C** is correct. For a function of the form  $f(x) = a(r)^{\frac{x}{k}}$ , where  $a$ ,  $r$ , and  $k$  are constants and  $r < 1$ , the value of  $f(x)$  decreases by  $100(1-r)\%$  for every increase of  $x$  by  $k$ . In the given function,  $a = 5,470$ ,  $r = 0.64$ , and  $k = 12$ . Therefore, for the given function, the value of  $f(x)$  decreases by  $100(1-0.64)\%$ , or  $36\%$ , for every increase of  $x$  by 12. Since  $f(x)$  represents the value, in dollars, of the equipment after  $x$  months of use, it follows that the value of the equipment decreases every 12 months by  $36\%$  of its value the preceding 12 months. Since there are 12 months in a year, the value of the equipment decreases each year by  $36\%$  of its value the preceding year. Thus, the value of  $p$  is 36.

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

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

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

## QUESTION 24

**Choice C** is correct. The median of a data set with an odd number of values, in ascending or descending order, is the middle value of the data set, and the range of a data set is the positive difference between the maximum and minimum values

in the data set. Since the dot plot shown gives the values in data set A in ascending order and there are 15 values in the data set, the eighth value in data set A, 23, is the median. The maximum value in data set A is 26 and the minimum value is 22, so the range of data set A is  $26 - 22$ , or 4. It's given that data set B is created by adding 56 to each of the values in data set A. Increasing each of the 15 values in data set A by 56 will also increase its median value by 56 making the median of data set B 79. Increasing each value of data set A by 56 does not change the range, since the maximum value of data set B is  $26 + 56$ , or 82, and the minimum value is  $22 + 56$ , or 78, making the range of data set B  $82 - 78$ , or 4. Therefore, the median of data set B is greater than the median of data set A, and the range of data set B is equal to the range of data set A.

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

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

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

## QUESTION 25

**Choice D** is correct. The graph in the  $xy$ -plane of an equation of the form  $(x - h)^2 + (y - k)^2 = r^2$  is a circle with center  $(h, k)$  and a radius of length  $r$ . It's given that circle A is represented by  $x^2 + (y - 1)^2 = 49$ , which can be rewritten as  $x^2 + (y - 1)^2 = 7^2$ . Therefore, circle A has center  $(0, 1)$  and a radius of length 7. Shifting circle A down two units is a rigid vertical translation of circle A that does not change its size or shape. Since circle B is obtained by shifting circle A down two units, it follows that circle B has the same radius as circle A, and for each point  $(x, y)$  on circle A, the point  $(x, y - 2)$  lies on circle B. Moreover, if  $(h, k)$  is the center of circle A, then  $(h, k - 2)$  is the center of circle B. Therefore, circle B has a radius of 7 and the center of circle B is  $(0, 1 - 2)$ , or  $(0, -1)$ . Thus, circle B can be represented by the equation  $x^2 + (y + 1)^2 = 7^2$ , or  $x^2 + (y + 1)^2 = 49$ .

*Choice A* is incorrect. This is the equation of a circle obtained by shifting circle A right 2 units. *Choice B* is incorrect. This is the equation of a circle obtained by shifting circle A up 2 units. *Choice C* is incorrect. This is the equation of a circle obtained by shifting circle A left 2 units.

## QUESTION 26

**Choice B** is correct. Let  $x$  represent the side length, in cm, of each square base. If the two prisms are glued together along a square base, the resulting prism has a surface area equal to twice the surface area of one of the prisms, minus the area of the two square bases that are being glued together, which yields  $2K - 2x^2$  cm<sup>2</sup>. It's given that this resulting surface area is equal to  $\frac{92}{47}K$  cm<sup>2</sup>, so  $2K - 2x^2 = \frac{92}{47}K$ . Subtracting  $\frac{92}{47}K$  from both sides of this equation yields  $2K - \frac{92}{47}K - 2x^2 = 0$ . This equation can be rewritten by multiplying  $2K$  on the left-hand side by  $\frac{47}{47}$ , which yields  $\frac{94}{47}K - \frac{92}{47}K - 2x^2 = 0$ , or  $\frac{2}{47}K - 2x^2 = 0$ . Adding  $2x^2$  to both sides of this equation yields  $\frac{2}{47}K = 2x^2$ . Multiplying both sides of this equation by  $\frac{47}{2}$  yields  $K = 47x^2$ . The surface area  $K$ , in cm<sup>2</sup>, of each rectangular prism is equivalent to the sum of the areas of the two square bases and the areas of the four lateral

faces. Since the height of each rectangular prism is 90 cm and the side length of each square base is  $x$  cm, it follows that the area of each square base is  $x^2$  cm<sup>2</sup> and the area of each lateral face is  $90x$  cm<sup>2</sup>. Therefore, the surface area of each rectangular prism can be represented by the expression  $2x^2 + 4(90x)$ , or  $2x^2 + 360x$ . Substituting this expression for  $K$  in the equation  $K = 47x^2$  yields  $2x^2 + 360x = 47x^2$ . Subtracting  $2x^2$  and  $360x$  from both sides of this equation yields  $0 = 45x^2 - 360x$ . Factoring  $x$  from the right-hand side of this equation yields  $0 = x(45x - 360)$ . Applying the zero product property, it follows that  $x = 0$  and  $45x - 360 = 0$ . Adding 360 to both sides of the equation  $45x - 360 = 0$  yields  $45x = 360$ . Dividing both sides of this equation by 45 yields  $x = 8$ . Since a side length of a rectangular prism can't be 0, the length of each square base is 8 cm.

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

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

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

## QUESTION 27

The correct answer is 600. It's given that 210 is  $p\%$  greater than 30. It follows that  $210 = \left(1 + \frac{p}{100}\right)(30)$ . Dividing both sides of this equation by 30 yields  $7 = 1 + \frac{p}{100}$ . Subtracting 1 from both sides of this equation yields  $6 = \frac{p}{100}$ . Multiplying both sides of this equation by 100 yields  $p = 600$ . Therefore, the value of  $p$  is 600.

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