CollegeBoard

# Answer Explanations
## SAT® Practice Test #3

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## Section 1: Reading Test

### QUESTION 1.

**Choice B is the best answer.** In the passage, Lady Carlotta is approached by the "imposingly attired lady" Mrs. Quabarl while standing at a train station (lines 32-35). Mrs. Quabarl assumes Lady Carlotta is her new nanny, Miss Hope: "You must be Miss Hope, the governess I've come to meet" (lines 36-37). Lady Carlotta does not correct Mrs. Quabarl's mistake and replies, "Very well, if I must I must" (line 39).

Choices A, C, and D are incorrect because the passage is not about a woman weighing a job choice, seeking revenge on an acquaintance, or disliking her new employer.

### QUESTION 2.

**Choice C is the best answer.** In lines 1-3, the narrator states that Lady Carlotta "stepped out on to the platform of the small wayside station and took a turn or two up and down its uninteresting length" in order to "kill time." In this context, Lady Carlotta was taking a "turn," or a short walk, along the platform while waiting for the train to leave the station.

Choices A, B, and D are incorrect because in this context "turn" does not mean slight movement, change in rotation, or course correction. While Lady Carlotta may have had to rotate her body while moving across the station, "took a turn" implies that Lady Carlotta took a short walk along the platform's length.

### QUESTION 3.

**Choice A is the best answer.** In lines 10-14, the narrator states that some of Lady Carlotta's acquaintances would often admonish, or criticize, Lady Carlotta for meddling in or openly expressing her opinion on other people's affairs.

Choices B, C, and D are incorrect because the narrator does not suggest that other people viewed Lady Carlotta as tactful, ambitious, or unfriendly.

## QUESTION 4.

**Choice A is the best answer.** In lines 10-14, the narrator states that people often criticized Lady Carlotta and suggested that she not interfere in other people's affairs, which were "none of her business." The fact that people often were critical of Lady Carlotta's behavior provides evidence that Lady Carlotta was outspoken.

Choices B, C, and D do not provide the best evidence that Lady Carlotta was outspoken. Choices B, C, and D mention Lady Carlotta, but do not specify how others view her.

## QUESTION 5.

**Choice C is the best answer.** The narrator notes that Lady Carlotta decided not to interfere when one of her "most eloquent exponents" was stuck in a tree because an angry boar was nearby (lines 14-22). This "eloquent exponent" was a woman who often criticized Lady Carlotta for interfering in other people's affairs. Lady Carlotta's decision to "put the doctrine of non-interference into practice" (to not help her female acquaintance who was "besieged" in a tree) suggests that Lady Carlotta has a sense of humor.

Choices A, B, and D are incorrect because the description of how she "put the doctrine of non-interference into practice" does not suggest that Lady Carlotta is deceptive or cruel, or explain a surprising change in her behavior.

## QUESTION 6.

**Choice A is the best answer.** The narrator explains that Mrs. Quabarl told Lady Carlotta about the "nature of the charge" when she gave Lady Carlotta details about the Quabarl children (line 53-61). Since Lady Carlotta is pretending to be a governess, the term "charge" refers to her responsibilities, or job duties, when caring for the Quabarl children.

Choices B, C, and D are incorrect because in this context "charge" does not mean attack, fee, or expense.

## QUESTION 7.

**Choice A is the best answer.** Lady Carlotta learns about Mrs. Quabarl's children Claude, Wilfrid, and Irene (lines 53-58). The narrator then describes Mrs. Quabarl's child Viola as "something or other else of a mould equally commonplace among children of that class and type in the twentieth century" (lines 58-61). This statement about Viola implies that all of the Quabarl children have skills typical, or "of a mould equally commonplace," to other peers in their social class.

Choices B, C, and D are incorrect because the narrator does not indicate that all of the Quabarl children are unusually creative and intelligent, hostile to the idea of having a governess, or more educated than their peers.

## QUESTION 8.

**Choice B is the best answer.** In lines 62-69, Mrs. Quabarl explains to Lady Carlotta that she wants her children to actively participate in their education, and that Lady Carlotta should not create lessons that require her children to simply memorize historical figures and dates. Mrs. Quabarl emphasizes an education centered on active engagement when she states that her children should "not only be TAUGHT . . . but INTERESTED in what they learn."

Choices A, C, and D are incorrect because the narrator does not suggest that Mrs. Quabarl favors an education that emphasizes traditional values, artistic experimentation, or factual retention.

## QUESTION 9.

**Choice B is the best answer.** In lines 77-82, the narrator describes Mrs. Quabarl as appearing "magnificent and autocratic," or outwardly domineering, but easily "cowed and apologetic" when someone challenges, or defies, her authority.

Choices A, C, and D are incorrect because the narrator does not describe Mrs. Quabarl as selfish, bitter, or frequently imprudent.

## QUESTION 10.

**Choice D is the best answer.** In lines 77-82, the narrator provides evidence that Mrs. Quabarl appears imposing, or autocratic, but is easily defied, or opposed: "She was one of those imperfectly self-assured individuals who are magnificent and autocratic as long as they are not seriously opposed. The least show of unexpected resistance goes a long way towards rendering them cowed and apologetic."

Choices A, B, and C do not provide the best evidence that Mrs. Quabarl appears imposing but is easily defied. Choices A and B are incorrect because they present Mrs. Quabarl's opinions on railway companies and education, and choice C is incorrect because it focuses on Lady Carlotta, not Mrs. Quabarl.

## QUESTION 11.

**Choice A is the best answer.** While the author predominantly supports the use of public transportation, in the third paragraph he recognizes some limitations to the public transportation system: it is a "depressing experience" (lines 25-26) and "underfunded, ill-maintained, and ill-planned" (line 31).

Choices B, C, and D are incorrect because the third paragraph does not expand upon an argument made in the first two paragraphs, provide an overview of a problem, or advocate ending the use of public transportation.

## QUESTION 12.

**Choice C is the best answer.** The author notes that in North America "hopping in a car almost always gets you to your destination more quickly" (lines 32-34). This statement suggests that speed is one advantage to driving in North America.

Choices A, B, and D are incorrect because the author does not cite environmental impact, convenience, or cost as advantages of driving in North America.

## QUESTION 13.

**Choice D is the best answer.** In lines 32-34, the author provides evidence that speed is one advantage to driving in North America, because driving "almost always gets you to your destination more quickly."

Choices A, B, and C do not provide the best evidence that speed is one advantage to driving in North America. Choices A and B are incorrect because they offer general information about using public transportation. Choice C is incorrect because although these lines mention North America, they focus on the disadvantages of public transportation.

## QUESTION 14.

**Choice B is the best answer.** The author argues in the fourth paragraph that public transportation "can be faster, more comfortable, and cheaper than the private automobile" (lines 36-37) and provides examples of fast and convenient public transportation systems.

Choices A, C, and D are incorrect because they focus on points made in the fourth paragraph rather than the paragraph's central idea.

## QUESTION 15.

**Choice B is the best answer.** In lines 35-37, the author provides evidence that some public transportation systems are superior to driving, because public transportation "can be faster, more comfortable, and cheaper than the private automobile."

Choices A, C, and D do not provide the best evidence that some public transportation systems are superior to driving, as they highlight points made in the fourth paragraph rather than the paragraph's central idea.

## QUESTION 16.

**Choice C is the best answer.** In the last paragraph, the author explains the trend that people who became adults around the end of the twentieth century are more willing to use public transportation than people from older generations. The author notes, "If you credit the demographers, this transit trend has legs" (lines 58-59). In this context, "credit" means to believe the demographers' claims about the trend.

Choices A, B, and D are incorrect because in this context, "credit" does not mean endow, attribute, or honor.

## QUESTION 17.

**Choice B is the best answer.** In lines 59-63, the author explains the trend of people who became adults around the end of the twentieth century "tend[ing] to favor cities over suburbs." In this context, these adults "favor," or prefer, cities over suburbs.

Choices A, C, and D are incorrect because in this context "favor" does not mean indulge, resemble, or serve.

## QUESTION 18.

**Choice B is the best answer**. In lines 63-67, the author explains that while riding on public transportation, people can use personal electronic devices, such as "iPads, MP3 players, Kindles, and smartphones."

Choices A, C, and D are incorrect because they do not show that public transportation is compatible with the use of personal electronic devices.

## QUESTION 19.

**Choice A is the best answer.** Figure 1 shows that 10.7% of public transportation passengers are students and 6.7% of public transportation passengers are retirees. Thus, more students than retirees use public transportation.

Choices B and C are incorrect because figure 1 shows that more employed than unemployed people use public transportation and that more employed people than homemakers use public transportation. Choice D is incorrect because figure 1 does not explain how frequently passengers use public transportation; it only identifies public transportation passengers by their primary occupation.

## QUESTION 20.

**Choice A is the best answer.** Figure 1 shows that 72% of public transportation passengers are "employed outside the home," and figure 2 indicates that 59.1% of public transportation trips are for "work." It can be inferred from these figures that many public transportation passengers take public transportation to their place of employment.

Choices B, C, and D are incorrect because figure 1 and figure 2 do not indicate that public transportation passengers primarily use the system to run errands, use their own car on weekends, or are planning to purchase a car.

## QUESTION 21.

**Choice D is the best answer.** The author explains that Ken Dial created an experiment to study the evolution of flight by observing how baby Chukars learn to fly. During the experiment, Dial noticed the unusual way Chukars use their "'wings and legs cooperatively'" to scale hay bales (lines 38-43), and he created "a series of ingenious experiments" (line 46) to study this observation. After his additional experiments, Dial determined that these baby birds angle "their wings differently from birds in flight" (lines 49-50).

Choices A, B, and C are incorrect because they do not accurately reflect the sequence of events in the passage.

## QUESTION 22.

**Choice A is the best answer.** In lines 6-9, the author explains that Dial was "challenged," or dared, by graduate students to develop "new data" on a long-standing scientific debate (the "ground-up-tree-down" theory).

Choices B, C, and D are incorrect because in this context "challenged" does not mean required, disputed with, or competed with.

## QUESTION 23.

**Choice A is the best answer.** The author explains that Dial created his initial experiment to try and create "new data on the age-old ground-up-tree-down debate," and that he looked for "clues" in "how baby game birds learned to fly" (lines 8-11). The note at the beginning of the passage explains the "age-old ground-up-tree down debate" and offers two different theories on how birds evolved to fly. Finally, the last paragraph of the passage discusses WAIR in an evolutionary context.

Choices B, C, and D are incorrect because they do not identify Dial's central assumption in setting up his research.

## QUESTION 24.

**Choice B is the best answer.** In lines 6-11, the author provides evidence that Dial's central assumption in setting up his research is that the acquisition of flight in young birds is linked to the acquisition of flight in their ancestors. The author notes that Dial created a project to "come up with new data on the age-old ground-up-tree-down debate."

Choices A, C, and D do not provide the best evidence that Dial's central assumption in setting up his research is that the acquisition of flight in young birds is linked to the acquisition of flight in their ancestors. Choices A, C, and D are incorrect because they focus on Dial's experiment and his observations on ground birds.

## QUESTION 25.

**Choice C is the best answer.** When a rancher observed Dial's laboratory setup, he was "incredulous" that the Chukars were living on the ground, and he advised Dial to give the birds "something to climb on" (lines 16-23). This "key piece of advice" (line 14) led Dial to add hay bales to his laboratory. Dial later noticed that the Chukars were using their legs and wings to scale the hay bales, and this observation became the focal point of his research.

Choices A, B, and D are incorrect because the incident with the local rancher did not serve to reveal Dial's motivation for creating the project, emphasize differences in laboratory and field research, or introduce a contributor to a scientific theory.

## QUESTION 26.

**Choice C is the best answer.** The author explains that Dial's "aha moment" came when he determined the Chukars used "their legs and wings cooperatively" to scale the hay bales (lines 40-42). Dial then created additional experiments to study how the birds dealt with gradually steeper inclines: "[he filmed] the birds as they raced up textured ramps tilted at increasing angles" (lines 46-48).

Choices A, B, and D are incorrect because Dial's "aha moment" was not followed by Dial teaching the birds to fly, studying videos to find out why the birds no longer hopped, or consulting with other researchers.

## QUESTION 27.

**Choice B is the best answer.** Dial observed that as the Chukars raced up steep ramps, they "began to flap" and "aimed their flapping down and backward, using the force . . . to keep their feet firmly pressed against the ramp" (lines 49-53). Dial determined that the position of their flapping wings facilitated the baby Chukars' traction on the steep ramps.

Choices A, C, and D are incorrect because the passage does not indicate that the Chukars' speed, alternation of wing and foot movement, or continual hopping motions facilitated their traction on steep ramps.

## QUESTION 28.

**Choice B is the best answer.** In lines 61-63, the author explains that Dial named his scientific finding "WAIR, for wing-assisted incline running, and went on to document it in a wide range of species." In this context, Dial "documented," or recorded, the existence of WAIR in numerous bird species.

Choices A, C, and D are incorrect because in this context, "document" does not mean to portray, publish, or process.

## QUESTION 29.

**Choice D is the best answer.** In lines 70-74, the author explains that gliding animals do not use a "flapping flight stroke," or WAIR, wing-assisted incline running. Since Chukars, a ground bird, use WAIR to help scale steep inclines, it can be reasonably inferred that gliding animals do not use WAIR to aid in climbing slopes.

Choices A, B, and C are incorrect because the passage does not include information on gliding animals' offspring, their method of locomotion, or their feeding habits.

## QUESTION 30.

**Choice D is the best answer.** In lines 73-75, the author provides evidence that "the flapping flight stroke" is "something gliding animals don't do."

Choices A, B, and C do not provide the best evidence that gliding animals do not use a flapping stroke to aid in climbing slopes. These choices do not contain information about gliding animals.

## QUESTION 31.

**Choice B is the best answer.** In lines 21-24, the authors of Passage 1 state society's "common happiness" is dependent on women never becoming involved in politics. In this context, the authors of Passage 1 are suggesting that all members of society can have a "common," or shared, happiness.

Choices A, C, and D are incorrect because in this context, "common" does not mean average, coarse, or similar.

## QUESTION 32.

**Choice C is the best answer.** In lines 25-30, the authors of Passage 1 state that women should seek "gentle occupations and the cares of the home" so they can avoid performing difficult, or "strenuous," and unpleasant, or "onerous," tasks.

Choices A, B, and D are incorrect because the authors of Passage 1 do not suggest that running a household and raising children are rewarding for both sexes, yield less value for society, or require professional or political skills.

## QUESTION 33.

**Choice C is the best answer.** In lines 25-30, the authors of Passage 1 provide evidence that women should run households and raise children because these roles do not require "strenuous habits and onerous duties."

Choices A, B, and D do not provide the best evidence that running a household and raising children entail very few activities that are difficult or unpleasant; rather, these lines offer general information about the differences between the sexes.

## QUESTION 34.

**Choice D is the best answer.** In lines 41-46, Wollstonecraft argues that if women do not receive an education "to become the companion of man," or one that is comparable to men's education, then society will not progress in "knowledge and virtue."

Choices A, B, and C are incorrect because Wollstonecraft does not suggest that society can progress only if women have happiness and financial security, follow societal rules, or replace men as figures of power.

## QUESTION 35.

**Choice C is the best answer.** Wollstonecraft argues that women should be granted an education comparable to men's so that truth is "common to all" (lines 41-46). Wollstonecraft states that education will "strengthen [women's] reason till she comprehend her duty" (lines 49-50). In this context, Wollstonecraft is arguing that education will improve women's "reason," or intellect, and allow women to consider their role in society.

Choices A, B, and D are incorrect because in this context "reason" does not mean motive, sanity, or explanation.

## QUESTION 36.

**Choice A is the best answer.** In lines 72-78, Wollstonecraft argues that the laws passed by society's leaders allow men to "contend for their freedom" but serve to "subjugate women." In this context, "subjugate" means to control. Wollstonecraft is arguing that society's leaders grant men freedoms that are denied to women.

Choices B, C, and D are incorrect because Wollstonecraft does not claim that society's leaders have granted freedoms that created a general reduction in individual virtue, caused arguments about happiness, or ensured equality for all people.

## QUESTION 37.

**Choice D is the best answer.** In lines 72-75, Wollstonecraft provides evidence that society's leaders grant freedoms that privilege men. She argues that while society's leaders believe they "are acting in the manner best calculated to promote [women's] happiness," their decisions don't allow women to "contend for their freedom."

Choices A, B, and C do not provide the best evidence that society's leaders grant freedoms that privilege men over women.

## QUESTION 38.

**Choice C is the best answer.** Wollstonecraft cites the statement made by the authors of Passage 1 that excluding women from political participation is "according to abstract principles . . . impossible to explain" (lines 61-65). Wollstonecraft then states that if the authors of Passage 1 can discuss "the abstract rights of man" they should be able to discuss the abstract rights of women (lines 66-69). In these lines, Wollstonecraft is developing her argument by highlighting a flaw in the reasoning presented by the authors of Passage 1.

Choices A, B, and D are incorrect because Wollstonecraft does not refer to the statement made in Passage 1 to call into question the authors' qualifications, dispute the assertion that women are excluded by their own government (sentence one of Passage 1), or validate the authors' conclusions on gender roles.

## QUESTION 39.

**Choice A is the best answer.** The authors of Passage 1 argue that while restricting women's freedoms may be "impossible to explain" (line 7), this restriction is necessary for society's overall happiness (lines 13-17). Wollstonecraft, however, strongly challenges this argument, asking the authors of Passage 1, "Who made man the exclusive judge" of which freedoms are granted to women, and likening society's male leaders to tyrants as they deny women their "civil and political rights" and leave them "groping in the dark" (lines 78-88).

Choices B, C, and D are incorrect because they do not characterize the overall relationship between Passage 1 and Passage 2.

## QUESTION 40.

**Choice D is the best answer.** The authors of Passage 1 admit that women are "excluded by the other half [men] from any participation in government" (lines 1-2), and Wollstonecraft states that society's male leaders create laws that deny women "civil and political rights" (line 86).

Choices A, B, and C are incorrect because the authors of both passages would not agree that women had the same preferences as men, required a good education, or were as happy as men.

## QUESTION 41.

**Choice A is the best answer.** Wollstonecraft argues in the final paragraph of Passage 2 that society's male leaders are like "tyrants" that deny women "civil and political rights" (lines 81-88). The authors of Passage 1 would most likely argue that allowing women these rights would be "a reversal of [society's] primary destines" as society's leaders should only seek women's interests as they pertain to the "wishes of nature," such as women's role as

mothers (lines 18-30). The authors of Passage 1 clarify that "nature" created two sexes for a particular reason, so while men can exercise civil and political rights, women are not naturally suited to these activities (lines 30-36).

Choices B and C are incorrect because they are not supported by information in Passage 1. Choice D is incorrect because the authors of Passage 1 do not mention "natural law," only the "wishes of nature."

## QUESTION 42.

**Choice C is the best answer.** When discussing problems with bee colonies, the authors use phrases like "we suspect" (line 19) and "we postulate" (line 21) to show they are hypothesizing reasons for bee colonies' susceptibility to mite infestations. The use of "can," "may," and "could" creates a tentative tone and provides further evidence that the authors believe, but are not certain, that their hypothesis is correct.

Choices A, B, and D are incorrect because the authors' use of "can," "may," and "could" does not create an optimistic, dubious, or critical tone.

## QUESTION 43.

**Choice C is the best answer.** In lines 24-28, the authors hypothesize that bee colonies will be susceptible to mite infestations if they do not occasionally feed on pyrethrum producing plants. In lines 42-46, they suggest creating a trial where a "small number of commercial honey bee colonies are offered a number of pyrethrum producing plants" to test their hypothesis.

Choices A, B, and D are incorrect because the authors do not hypothesize that honeybees' exposure to both pyrethrums and mites will cause the honeybees to develop secondary infections, that beekeepers should increase their use of insecticides, or that humans are more susceptible to varroa mites.

## QUESTION 44.

**Choice D is the best answer.** In lines 24-28, the authors provide evidence that a bee colony may be more resistant to mite infections if the bees eat pyrethrums because this diet may help prevent bees from becoming "immunocompromised or nutritionally deficient." In lines 42-50, the authors suggest testing this hypothesis in a trial on honeybees.

Choices A, B, and C do not describe any of the authors' hypotheses.

## QUESTION 45.

**Choice D is the best answer.** The authors explain that when beekeepers use commercially produced insecticides to fight mite infections, they may "further weaken" bees that are "immunocompromised or nutritionally deficient" (lines 31-35).

Choices A, B, and C are incorrect because the authors do not suggest that beekeepers' use of commercially produced insecticides increases mite populations, kills bacteria, or destroys bees' primary food source.

## QUESTION 46.

**Choice C is the best answer.** In lines 31-35, the authors provide evidence that beekeepers' use of commercially produced insecticides may cause further harm to "immunocompromised or nutritionally deficient bees."

Choices A, B, and D are incorrect because they do not provide the best evidence that beekeepers' use of commercially produced insecticides may be harmful to bees; choices A, B, and D focus on mite infestations' impact on honeybees.

## QUESTION 47.

**Choice B is the best answer.** In lines 31-35, the authors argue that beekeepers' use of insecticides to control mite infestations may be harmful to some bees. The authors then state, "We further postulate that the proper dosage necessary to prevent mite infestation may be better left to the bees" (lines 35-37). In this context, the authors "postulate," or put forth the idea that the bees may naturally control mite infestations better than insecticides.

Choices A, C, and D are incorrect because in this context, "postulate" does not mean to make an unfounded assumption, question a belief or theory, or conclude based on firm evidence.

## QUESTION 48.

**Choice B is the best answer.** In the fourth paragraph the authors propose a trial to study if honeybees' consumption of pyrethrum producing plants helps the honeybees defend against mite infestations. In the experiment, the authors plan to offer honey bee colonies both pyrethrum producing plants and "a typical bee food source such as clover" to determine if these different diets affect the bees' susceptibility to mite infestations.

Choices A, C, and D are incorrect because the main purpose of the fourth paragraph is not to summarize the results of an experiment, provide a comparative nutritional analysis, or predict an outcome of an unfinished experiment.

## QUESTION 49.

**Choice A is the best answer.** In lines 43-45, the authors propose a scientific trial in which honeybees are "offered a number of pyrethrum producing plants, as well as a typical bee food source such as clover." Since the authors contrast the "pyrethrum producing plants" with clover, a "typical bee food source," it can be assumed that clover does not produce pyrethrums.

Choice B is incorrect because it is stated in the passage. Choices C and D are incorrect because they are not assumptions made by the authors.

### QUESTION 50.

**Choice B is the best answer.** The table shows that 77 percent of the honeybee colonies with colony collapse disorder were infected by all four pathogens.

Choices A, C, and D are incorrect because they do not identify the percent of honeybee colonies with colony collapse disorder that were infected by all four pathogens as based on data in the table.

### QUESTION 51.

**Choice D is the best answer.** The table shows that 81 percent of colonies without colony collapse disorder were affected by the pathogen *Nosema ceranae*.

Choices A, B, and C are incorrect because they do not identify the pathogen that infected the highest percentage of honeybee colonies without colony collapse disorder as based on data in the table.

### QUESTION 52.

**Choice D is the best answer.** The table discusses pathogen occurrence in honeybee colonies, but it includes no information as to whether these honeybees were infected with mites. Because the table does not suggest mites infested the honeybee colonies, no conclusions can be made as to whether mites increased the honeybees' "susceptibility to secondary infection with fungi, bacteria or viruses" (lines 4-5).

Choices A, B, and C are incorrect because the table provides no information about whether these honeybees were infected with mites.

## Section 2: Writing and Language Test

### QUESTION 1.

**Choice A is the best answer** because by providing the comparative adjective "healthier" and the word "more" to make "productive" comparative, it creates a parallel structure within the list that begins with "happier."

Choices B, C, and D are incorrect because none creates a parallel structure within the list of qualities.

### QUESTION 2.

**Choice B is the best answer.** The ways in which exposure to natural light affects employees is the main subject of the passage.

Choices A, C, and D are incorrect because none introduces the topic discussed in the remainder of the passage.

## QUESTION 3.

**Choice C is the best answer.** It accurately notes that the proposed sentence would be placed directly between the first mention of circadian rhythms and the explanation of the term.

Choices A, B, and D are incorrect because each misinterprets the relationship between the proposed additional text and the ideas in the paragraph.

## QUESTION 4.

**Choice C is the best answer**. It provides the correct possessive construction for "body," which must be a singular noun when discussed in general terms as in this sentence. Choice C also provides the correct plural construction for "clocks."

Choices A, B, and D are incorrect because each applies either a possessive or a plural construction in a place where it doesn't belong.

## QUESTION 5.

**Choice A is the best answer**. The singular verb "is" agrees with the singular noun "absenteeism."

Choices B, C, and D are incorrect because each provides a verb that either fails to agree with the singular subject "absenteeism" or introduces redundancy.

## QUESTION 6.

**Choice B is the best answer**. It contains a direct reference to productivity, the topic introduced in the previous sentence.

Choices A, C, and D are incorrect because none directly addresses employee productivity, the primary subject of the previous sentence.

## QUESTION 7.

**Choice A is the best answer**. It opens with a reference to lowered worker productivity, creating a transition from the previous paragraph, and clearly positions the high energy costs of artificial light sources as an additional disadvantage.

Choices B, C, and D are incorrect because none of the choices offer an adequate transition from the previous paragraph: Each awkwardly inserts the issue of lower worker productivity into a statement about the high energy costs of artificial light sources.

## QUESTION 8.

**Choice D is the best answer**. The word "annual" is adequate to communicate that the savings occurred every year.

Choices A, B, and C are incorrect because each proposes an option that would result in a redundancy with "annual."

## QUESTION 9.

**Choice C is the best answer**. It provides a transitional adverb that accurately communicates that this sentence describes an option that companies could choose ("light tubes") instead of the option described in the previous sentence ("full-pane windows").

Choices A, B, and D are incorrect because each proposes a transitional adverb that does not accurately reflect the relationship between this sentence and the one preceding it.

## QUESTION 10.

**Choice C is the best answer**. It provides the correct relative pronoun to correspond with the plural referent "light tubes" and the correct verb to introduce the definition that follows.

Choices A, B, and D are incorrect because each offers a pronoun inappropriate for opening a dependent clause defining "light tubes."

## QUESTION 11.

**Choice B is the best answer**. The preposition "of" idiomatically follows the noun "means," particularly as a way to connect it to another noun or verb.

Choices A, C, and D are incorrect because each results in nonstandard phrasing with "means."

## QUESTION 12.

**Choice A is the best answer**. The plural reflexive pronoun "themselves" corresponds with the plural noun "settlers."

Choices B, C, and D are incorrect because each provides either a nonstandard phrase or a singular pronoun that does not correspond with "settlers."

## QUESTION 13.

**Choice C is the best answer**. It creates a transition from the poor food quality mentioned in the previous sentence to the information about Harvey in the remainder of the sentence.

Choices A, B, and D are incorrect because none offers a transition from the previous sentence or a detail that corresponds precisely with the information in the remainder of the sentence.

## QUESTION 14.

**Choice D is the best answer**. It correctly provides a comma to close the modifying clause "an English-born entrepreneur," which opens with a comma.

Choices A, B, and C are incorrect because each proposes punctuation that creates an inappropriately strong separation between the subject "Fred Harvey" and the verb "decided."

## QUESTION 15.

**Choice B is the best answer**. It provides the plural verb and plural possessive pronoun that grammatically correspond to the plural referent "Harvey Houses."

Choices A, C, and D are incorrect because each either fails to provide a verb that corresponds with the plural referent "Harvey Houses" or fails to provide the appropriate possessive pronoun.

## QUESTION 16.

**Choice C is the best answer.** It accurately echoes an earlier characterization of the food as being of "terrible quality," while maintaining the established tone of the passage.

Choices A, B, and D are incorrect either because the word is less formal than the established tone of the passage ("icky") or because it illogically attributes agency to food ("sinister," "surly").

## QUESTION 17.

**Choice C is the best answer**. It accurately interprets "not content to follow conventional business practices" as logically introducing the new practice of "employing women" described in the following sentences.

Choices A, B, and D are incorrect because none recognizes why the sentence is relevant to this particular location in the passage.

## QUESTION 18.

**Choice B is the best answer.** It is concise and free of redundancies.

Choices A, C, and D are incorrect because each pairs "overwhelming" and "tremendous," adjectives so close in meaning that together they present a redundancy.

## QUESTION 19.

**Choice D is the best answer**. It contains the pronoun "they," a necessary reference to "such regulations" in the previous clause.

Choices A, B, and C are incorrect because each lacks a necessary subject, such as a pronoun or noun.

## QUESTION 20.

**Choice C is the best answer**. It refers directly to benefits for the restaurants' female employees, the subject of the previous sentence.

Choices A, B, and D are incorrect because none logically builds upon the sentence that precedes it.

## QUESTION 21.

**Choice D is the best answer**. It provides punctuation that indicates that the opening dependent clause modifies the subject "Harvey Girls."

Choices A, B, and C are incorrect because each uses the punctuation for a dependent clause ("Living independently and demonstrating an intense work ethic") as if it were an independent clause.

## QUESTION 22.

**Choice A is the best answer**. It recognizes that the new information supports the previous sentence's claim that "the Harvey Girls became known as a transformative force."

Choices B, C, and D are incorrect because each misinterprets the relationship between the proposed text and the passage.

## QUESTION 23.

**Choice A is the best answer**. It opens with a clause that identifies how 1-MCP affects apples, which focuses the sentence on 1-MCP as the subject and allows the ideas in the sentence to progress logically.

Choices B, C, and D are incorrect because each displays awkward or flawed modification and progression of ideas, or creates redundancy.

## QUESTION 24.

**Choice D is the best answer**. Only the comma is necessary to separate "ethylene" from the appositive noun phrase that defines it.

Choices A, B, and C are incorrect because each creates a comma splice and/or adds unnecessary words.

## QUESTION 25.

**Choice B is the best answer**. It offers an adjective that accurately describes fresh apples.

Choices A, C, and D are incorrect because each proposes an adjective that does not describe a plausible fruit texture.

## QUESTION 26.

**Choice A is the best answer**. The plural possessive pronoun "their" corresponds with the plural referent "apples."

Choices B, C, and D are incorrect because none provides a pronoun that is both possessive and plural.

## QUESTION 27.

**Choice D is the best answer**. It provides the pronoun "who," which accurately identifies the referent "consumers" as people and appropriately begins the relative clause.

Choices A, B, and C are incorrect because each contains a pronoun that either does not correspond with the human referent "consumers" or does not correctly begin the relative clause.

## QUESTION 28.

**Choice B is the best answer**. It provides the present tense verb "do," which corresponds to the present tense established earlier in the sentence.

Choices A, C, and D are incorrect because each contains a verb that deviates from the simple present tense established in the sentence.

## QUESTION 29.

**Choice B is the best answer**. It provides a colon to appropriately introduce the clause that follows, an elaboration on the preceding claim that Bartlett pears are an example of fruit that "do not respond as well to 1-MCP treatment."

Choices A, C, and D are incorrect because each either creates a comma splice or uses a transitional phrase ("For instance") illogically.

## QUESTION 30.

**Choice B is the best answer**. Sentence 4 begins with "But," indicating a contrast with a previous idea, and goes on to mention that 1-MCP can have negative effects. Sentence 1 continues the discussion of benefits of 1-MCP, and sentence 2 names the adverse effect of limiting scent production, so the most logical spot for sentence 4 is between these sentences.

Choices A, C, and D are incorrect because each proposes placing the sentence at a point where it would compromise the logical development of ideas in the paragraph.

## QUESTION 31.

**Choice D is the best answer**. It most accurately reflects the data in the graph, which shows a steep decrease in percentage of flesh browning when untreated apples are left in the open air for three weeks rather than placed immediately into a controlled atmosphere.

Choices A, B, and C are incorrect because each presents an inaccurate interpretation of the data in the graph.

## QUESTION 32.

**Choice B is the best answer.** It accurately interprets the data as indicating that "roughly half of their flesh turns brown" when apples are treated with 1-MCP: both bars representing 1-MCP treatment are near the 50% line.

Choices A, C, and D are incorrect because each proposes an inaccurate interpretation of the data.

## QUESTION 33.

**Choice C is the best answer**. It describes an action, weighing the relative values, that fruit sellers must take as a result of 1-MCP's limitations.

Choices A, B, and D are incorrect because none specifically connects the shortcomings of 1-MCP with any action on the part of fruit sellers.

## QUESTION 34.

**Choice D is the best answer**. It clearly communicates that the preceding dependent clause modifies "works by human artists."

Choices A, B, and C are incorrect because each fails to link the preceding dependent clause to an independent clause, resulting in an incomplete sentence.

## QUESTION 35.

**Choice B is the best answer**. It provides the necessary em dash to close the aside about artist C.M. Coolidge, which opens with an em dash.

Choices A, C, and D are incorrect because each provides closing punctuation for the aside that does not correspond with the opening punctuation.

## QUESTION 36.

**Choice C is the best answer.** The plural verb "portray" corresponds with the plural noun "works of art."

Choices A, B, and D are incorrect because none provides the plural verb in the present tense that the sentence requires.

## QUESTION 37.

**Choice D is the best answer**. It names a "museum in Russia," which is the subject of the next paragraph.

Choices A, B, and C are incorrect because each provides an overly general phrase that does not specifically link to the paragraph that follows.

## QUESTION 38.

**Choice C is the best answer**. It creates parallelism with the verb "could damage" that appears earlier in the clause ("rodents that could damage . . . [and could] scare off visitors").

Choices A, B, and D are incorrect because each presents a verb tense that is inconsistent with the sentence's other present-tense verb ("could damage") that shares "mice, rats, and other rodents" as its subject.

## QUESTION 39.

**Choice C is the best answer**. Sentence 5, which discusses Peter the Great's daughter continuing his tradition, most logically follows the sentence about Peter the Great.

Choices A, B, and D are incorrect because each presents a placement that would compromise the logical development of the paragraph.

## QUESTION 40.

**Choice B is the best answer**. "Commissioned" describes the act of hiring an artist to create a specific work.

Choices A, C, and D are incorrect because each provides a word that does not correspond logically with the context.

## QUESTION 41.

**Choice D is the best answer**. It provides punctuation that clearly places the noun phrase "digital artist Eldar Zakirov" as an appositive identifying the person mentioned in the previous phrase, "The person chosen for this task."

Choices A, B, and C are incorrect because each fails to open and close the uninterrupted appositive noun phrase "digital artist Eldar Zakirov" with commas.

## QUESTION 42.

**Choice A is the best answer**. The phrase "noble individuals" corresponds with the subsequent examples of portraits where the cats are depicted as "aristocratic," "stately," and like a "trusted royal advisor."

Choices B, C, and D are incorrect because each provides a statement that does not logically connect to the examples that follow.

### QUESTION 43.

**Choice D is the best answer**. It accurately states that the information in the proposed additional sentence is not related to formal portraits of cats, the main topic of the paragraph.

Choices A, B, and C are incorrect because each fails to recognize that the proposed sentence interrupts the logical development of the paragraph.

### QUESTION 44.

**Choice D is the best answer**. The tone corresponds with that established in the passage, and the phrasing appropriately focuses on the cats' contribution to protecting artwork rather than on simply killing rodents.

Choices A, B, and C are incorrect because none makes explicit the link between the cats' hunting activities and the service to the museum.

## Section 3: Math Test — No Calculator

### QUESTION 1.

**Choice C is correct**. The painter's fee is given by $nK\ell h$, where $n$ is the number of walls, $K$ is a constant with units of dollars per square foot, $\ell$ is the length of each wall in feet, and $h$ is the height of each wall in feet. Examining this equation shows that $\ell$ and $h$ will be used to determine the area of each wall. The variable $n$ is the number of walls, so $n$ times the area of the walls will give the amount of area that will need to be painted. The only remaining variable is $K$, which represents the cost per square foot and is determined by the painter's time and the price of paint. Therefore, $K$ is the only factor that will change if the customer asks for a more expensive brand of paint.

Choice A is incorrect because a more expensive brand of paint would not cause the height of each wall to change. Choice B is incorrect because a more expensive brand of paint would not cause the length of each wall to change. Choice D is incorrect because a more expensive brand of paint would not cause the number of walls to change.

### QUESTION 2.

**Choice D is correct**. Dividing each side of the equation $3r = 18$ by 3 gives $r = 6$. Substituting 6 for $r$ in the expression $6r + 3$ gives $6(6) + 3 = 39$.

Alternatively, the expression $6r + 3$ can be rewritten as $2(3r) + 3$. Substituting 18 for $3r$ in the expression $2(3r) + 3$ yields $2(18) + 3 = 36 + 3 = 39$.

Choice A is incorrect because 6 is the value of $r$; however, the question asks for the value of the expression $6r + 3$. Choices B and C are incorrect because if $6r + 3$ were equal to either of these values, then it would not be possible for $3r$ to be equal to 18, as stated in the question.

## QUESTION 3.

**Choice D is correct.** By definition, $a^{\frac{m}{n}} = \sqrt[n]{a^m}$ for any positive integers $m$ and $n$. It follows, therefore, that $a^{\frac{2}{3}} = \sqrt[3]{a^2}$.

Choice A is incorrect. By definition, $a^{\frac{1}{n}} = \sqrt[n]{a}$ for any positive integer $n$. Applying this definition as well as the power property of exponents to the expression $\sqrt{a^{\frac{1}{3}}}$ yields $\sqrt{a^{\frac{1}{3}}} = \left(a^{\frac{1}{3}}\right)^{\frac{1}{2}} = a^{\frac{1}{6}}$. Because $a^{\frac{1}{6}} \neq a^{\frac{2}{3}}$, $\sqrt{a^{\frac{1}{3}}}$ is not the correct answer. Choice B is incorrect. By definition, $a^{\frac{1}{n}} = \sqrt[n]{a}$ for any positive integer $n$. Applying this definition as well as the power property of exponents to the expression $\sqrt{a^3}$ yields $\sqrt{a^3} = (a^3)^{\frac{1}{2}} = a^{\frac{3}{2}}$. Because $a^{\frac{3}{2}} \neq a^{\frac{2}{3}}$, $\sqrt{a^3}$ is not the correct answer. Choice C is incorrect. By definition, $a^{\frac{1}{n}} = \sqrt[n]{a}$ for any positive integer $n$. Applying this definition as well as the power property of exponents to the expression $\sqrt[3]{a^{\frac{1}{2}}}$ yields $\sqrt[3]{a^{\frac{1}{2}}} = \left(a^{\frac{1}{2}}\right)^{\frac{1}{3}} = a^{\frac{1}{6}}$. Because $a^{\frac{1}{6}} \neq a^{\frac{2}{3}}$, $\sqrt[3]{a^{\frac{1}{2}}}$ is not the correct answer.

## QUESTION 4.

**Choice B is correct.** To fit the scenario described, 30 must be twice as large as $x$. This can be written as $2x = 30$.

Choices A, C, and D are incorrect. These equations do not correctly relate the numbers and variables described in the stem. For example, the expression in choice C states that 30 is half as large as $x$, not twice as large as $x$.

## QUESTION 5.

**Choice C is correct.** Multiplying each side of $\frac{5}{x} = \frac{15}{x + 20}$ by $x(x + 20)$ gives $15x = 5(x + 20)$. Distributing the 5 over the values within the parentheses yields $15x = 5x + 100$, and then subtracting $5x$ from each side gives $10x = 100$. Finally, dividing both sides by 10 gives $x = 10$. Therefore, the value of $\frac{x}{5}$ is $\frac{10}{5} = 2$.

Choice A is incorrect because it is the value of $x$, not $\frac{x}{5}$. Choices B and D are incorrect and may be the result of errors in arithmetic operations on the given equation.

## QUESTION 6.

**Choice C is correct.** Multiplying each side of the equation $2x - 3y = -14$ by 3 gives $6x - 9y = -42$. Multiplying each side of the equation $3x - 2y = -6$ by 2 gives $6x - 4y = -12$. Then, subtracting the sides of $6x - 4y = -12$ from the corresponding sides of $6x - 9y = -42$ gives $-5y = -30$. Dividing each side of the equation $-5y = -30$ by $-5$ gives $y = 6$. Finally, substituting 6 for $y$ in $2x - 3y = -14$ gives $2x - 3(6) = -14$, or $x = 2$. Therefore, the value of $x - y$ is $2 - 6 = -4$.

Alternatively, adding the corresponding sides of $2x - 3y = -14$ and $3x - 2y = -6$ gives $5x - 5y = -20$, from which it follows that $x - y = -4$.

Choices A, B, and D are incorrect and may be the result of an arithmetic error when solving the system of equations.

## QUESTION 7.

**Choice C is correct.** If $x - b$ is a factor of $f(x)$, then $f(b)$ must equal 0. Based on the table, $f(4) = 0$. Therefore, $x - 4$ must be a factor of $f(x)$.

Choice A is incorrect because $f(2) \neq 0$; choice B is incorrect because no information is given about the value of $f(3)$, so $x - 3$ may or may not be a factor of $f(x)$; and choice D is incorrect because $f(5) \neq 0$.

## QUESTION 8.

**Choice A is correct.** The linear equation $y = kx + 4$ is in slope-intercept form, and so the slope of the line is $k$. Since the line contains the point $(c, d)$, the coordinates of this point satisfy the equation $y = kx + 4$: $d = kc + 4$. Solving this equation for the slope, $k$, gives $k = \frac{d - 4}{c}$.

Choices B, C, and D are incorrect and may be the result of errors in substituting the coordinates of $(c, d)$ in $y = kx + 4$ or of errors in solving for $k$ in the resulting equation.

## QUESTION 9.

**Choice A is correct.** If a system of two linear equations has no solution, then the lines represented by the equations in the coordinate plane are parallel. The equation $kx - 3y = 4$ can be rewritten as $y = \frac{k}{3}x - \frac{4}{3}$, where $\frac{k}{3}$ is the slope of the line, and the equation $4x - 5y = 7$ can be rewritten as $y = \frac{4}{5}x - \frac{7}{5}$, where $\frac{4}{5}$ is the slope of the line. If two lines are parallel, then the slopes of the line are equal. Therefore, $\frac{4}{5} = \frac{k}{3}$, or $k = \frac{12}{5}$. (Since the $y$-intercepts of the lines represented by the equations are $-\frac{4}{3}$ and $-\frac{7}{5}$, the lines are parallel, not identical.)

Choices B, C, and D are incorrect and may be the result of a computational error when rewriting the equations or solving the equation representing the equality of the slopes for $k$.

## QUESTION 10.

**Choice A is correct.** Substituting 25 for $y$ in the equation $y = (x - 11)^2$ gives $25 = (x - 11)^2$. It follows that $x - 11 = 5$ or $x - 11 = -5$, so the $x$-coordinates of the two points of intersection are $x = 16$ and $x = 6$, respectively. Since both points of intersection have a $y$-coordinate of 25, it follows that the two points are (16, 25) and (6, 25). Since these points lie on the horizontal line $y = 25$, the distance between these points is the positive difference of the $x$-coordinates: $16 - 6 = 10$.

Choices B, C, and D are incorrect and may be the result of an error in solving the quadratic equation that results when substituting 25 for $y$ in the given quadratic equation.

## QUESTION 11.

**Choice B is correct.** Since the angles marked $y°$ and $u°$ are vertical angles, $y = u$. Subtracting the sides of $y = u$ from the corresponding sides of $x + y = u + w$ gives $x = w$. Since the angles marked $w°$ and $z°$ are vertical angles, $w = z$. Therefore, $x = z$, and so I must be true.

The equation in II need not be true. For example, if $x = w = z = t = 70$ and $y = u = 40$, then all three pairs of vertical angles in the figure have equal measure and the given condition $x + y = u + w$ holds. But it is not true in this case that $y$ is equal to $w$. Therefore, II need not be true.

Since the top three angles in the figure form a straight angle, it follows that $x + y + z = 180$. Similarly, $w + u + t = 180$, and so $x + y + z = w + u + t$. Subtracting the sides of the given equation $x + y = u + w$ from the corresponding sides of $x + y + z = w + u + t$ gives $z = t$. Therefore, III must be true. Since only I and III must be true, the correct answer is choice B.

Choices A, C, and D are incorrect because each of these choices includes II, which need not be true.

## QUESTION 12.

**Choice A is correct.** The parabola with equation $y = a(x - 2)(x + 4)$ crosses the $x$-axis at the points $(-4, 0)$ and $(2, 0)$. The $x$-coordinate of the vertex of the parabola is halfway between the $x$-coordinates of $(-4, 0)$ and $(2, 0)$. Thus, the $x$-coordinate of the vertex is $\frac{-4 + 2}{2} = -1$. This is the value of $c$. To find the $y$-coordinate of the vertex, substitute $-1$ for $x$ in $y = a(x - 2)(x + 4)$: $y = a(x - 2)(x + 4) = a(-1 - 2)(-1 + 4) = a(-3)(3) = -9a$.

Therefore, the value of $d$ is $-9a$.

Choice B is incorrect because the value of the constant term in the equation is not the $y$-coordinate of the vertex, unless there were no linear terms in the quadratic. Choice C is incorrect and may be the result of a sign error in finding the $x$-coordinate of the vertex. Choice D is incorrect because the negative of the coefficient of the linear term in the quadratic is not the $y$-coordinate of the vertex.

## QUESTION 13.

**Choice B is correct.** Since $24x^2 + 25x - 47$ divided by $ax - 2$ is equal to $-8x - 3$ with remainder $-53$, it is true that $(-8x - 3)(ax - 2) - 53 = 24x^2 + 25x - 47$. (This can be seen by multiplying each side of the given equation by $ax - 2$). This can be rewritten as $-8ax^2 + 16x - 3ax = 24x^2 + 25x - 47$. Since the coefficients of the $x^2$-term have to be equal on both sides of the equation, $-8a = 24$, or $a = -3$.

Choices A, C, and D are incorrect and may be the result of either a conceptual misunderstanding or a computational error when trying to solve for the value of $a$.

## QUESTION 14.

**Choice A is correct.** Dividing each side of the given equation by 3 gives the equivalent equation $x^2 + 4x + 2 = 0$. Then using the quadratic formula, $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$, with $a = 1$, $b = 4$, and $c = 2$, gives the solutions $x = -2 \pm \sqrt{2}$.

Choices B, C, and D are incorrect and may be the result of errors when applying the quadratic formula.

## QUESTION 15.

**Choice D is correct.** If $C$ is graphed against $F$, the slope of the graph is equal to $\frac{5}{9}$ degrees Celsius/degrees Fahrenheit, which means that for an increase of 1 degree Fahrenheit, the increase is $\frac{5}{9}$ of 1 degree Celsius. Thus, statement I is true. This is the equivalent to saying that an increase of 1 degree Celsius is equal to an increase of $\frac{9}{5}$ degrees Fahrenheit. Since $\frac{9}{5} = 1.8$, statement II is true. On the other hand, statement III is not true, since a temperature increase of $\frac{9}{5}$ degrees Fahrenheit, not $\frac{5}{9}$ degree Fahrenheit, is equal to a temperature increase of 1 degree Celsius.

Choices A, B, and C are incorrect because each of these choices omits a true statement or includes a false statement.

## QUESTION 16.

**The correct answer is either 1 or 2.** The given equation can be rewritten as $x^5 - 5x^3 + 4x = 0$. Since the polynomial expression on the left has no constant term, it has $x$ as a factor: $x(x^4 - 5x^2 + 4) = 0$. The expression in parentheses is a quadratic equation in $x^2$ that can be factored, giving $x(x^2 - 1)(x^2 - 4) = 0$. This further factors as $x(x - 1)(x + 1)(x - 2)(x + 2) = 0$. The solutions for $x$ are $x = 0$, $x = 1$, $x = -1$, $x = 2$, and $x = -2$. Since it is given that $x > 0$, the possible values of $x$ are $x = 1$ and $x = 2$. Either 1 or 2 may be gridded as the correct answer.

## QUESTION 17.

**The correct answer is 2.** First, clear the fractions from the given equation by multiplying each side of the equation by 36 (the least common multiple of 4, 9, and 12). The equation becomes $28x - 16x = 9 + 15$. Combining like terms on each side of the equation yields $12x = 24$. Finally, dividing both sides of the equation by 12 yields $x = 2$.

Alternatively, since $\frac{7}{9}x - \frac{4}{9}x = \frac{3}{9}x = \frac{1}{3}x$ and $\frac{1}{4} + \frac{5}{12} = \frac{3}{12} + \frac{5}{12} = \frac{8}{12} = \frac{2}{3}$, the given equation simplifies to $\frac{1}{3}x = \frac{2}{3}$. Multiplying each side of $\frac{1}{3}x = \frac{2}{3}$ by 3 yields $x = 2$.

## QUESTION 18.

**The correct answer is 105.** Since $180 - z = 2y$ and $y = 75$, it follows that $180 - z = 150$, and so $z = 30$. Thus, each of the base angles of the isosceles triangle on the right has measure $\frac{180° - 30°}{2} = 75°$. Therefore, the measure of the angle marked $x°$ is $180° - 75° = 105°$, and so the value of $x$ is 105.

## QUESTION 19.

**The correct answer is 370.** A system of equations can be used where $h$ represents the number of calories in a hamburger and $f$ represents the number of calories in an order of fries. The equation $2h + 3f = 1700$ represents the fact that 2 hamburgers and 3 orders of fries contain a total of 1700 calories, and the equation $h = f + 50$ represents the fact that one hamburger contains 50 more calories than an order of fries. Substituting $f + 50$ for $h$ in $2h + 3f = 1700$ gives $2(f + 50) + 3f = 1700$. This equation can be solved as follows:

$$\begin{aligned} 2f + 100 + 3f &= 1700 \\ 5f + 100 &= 1700 \\ 5f &= 1600 \\ f &= 320 \end{aligned}$$

The number of calories in an order of fries is 320, so the number of calories in a hamburger is 50 more than 320, or 370.

### QUESTION 20.

**The correct answer is $\frac{3}{5}$ or .6.** Triangle $ABC$ is a right triangle with its right angle at $B$. Thus, $\overline{AC}$ is the hypotenuse of right triangle $ABC$, and $\overline{AB}$ and $\overline{BC}$ are the legs of right triangle $ABC$. By the Pythagorean theorem, $AB = \sqrt{20^2 - 16^2} = \sqrt{400 - 256} = \sqrt{144} = 12$. Since triangle $DEF$ is similar to triangle $ABC$, with vertex $F$ corresponding to vertex $C$, the measure of angle $F$ equals the measure of angle $C$. Thus, $\sin F = \sin C$. From the side lengths of triangle $ABC$, $\sin C = \frac{\text{opposite side}}{\text{hypotenuse}} = \frac{AB}{AC} = \frac{12}{20} = \frac{3}{5}$. Therefore, $\sin F = \frac{3}{5}$. Either $\frac{3}{5}$ or its decimal equivalent, .6, may be gridded as the correct answer.

## Section 4: Math Test – Calculator

### QUESTION 1.

**Choice C is correct.** Marilyn's distance from her campsite remained the same during the time she ate lunch. This is represented by a horizontal segment in the graph. The only horizontal segment in the graph starts at a time of about 1:10 P.M. and ends at about 1:40 P.M. Therefore, Marilyn finished her lunch and continued her hike at about 1:40 P.M.

Choices A, B, and D are incorrect and may be the result of a misinterpretation of the graph. For example, choice B is the time Marilyn started her lunch, and choice D is the time Marilyn was at the maximum distance from her campsite.

### QUESTION 2.

**Choice B is correct.** Of the 25 people who entered the contest, there are 8 females under age 40 and 2 males age 40 or older. Therefore, the probability that the contest winner will be either a female under age 40 or a male age 40 or older is $\frac{8}{25} + \frac{2}{25} = \frac{10}{25}$.

Choice A is incorrect and may be the result of dividing 8 by 2, instead of adding 8 to 2, to find the probability. Choice C is incorrect; it is the probability that the contest winner will be either a female under age 40 or a female age 40 or older. Choice D is incorrect and may be the result of multiplying 8 and 2, instead of adding 8 and 2, to find the probability.

### QUESTION 3.

**Choice C is correct.** Based on the graph, sales increased in the first 3 years since 1997, which is until year 2000, and then generally decreased thereafter.

Choices A, B, and D are incorrect; each of these choices contains inaccuracies in describing the general trend of music album sales from 1997 to 2000.

## QUESTION 4.

**Choice C is correct.** The graph of $y = f(n)$ in the coordinate plane is a line that passes through each of the points given in the table. From the table, one can see that an increase of 1 unit in $n$ results in an increase of 3 units in $f(n)$; for example, $f(2) - f(1) = 1 - (-2) = 3$. Therefore, the graph of $y = f(n)$ in the coordinate plane is a line with slope 3. Only choice C is a line with slope 3. The $y$-intercept of the line is the value of $f(0)$. Since an increase of 1 unit in $n$ results in an increase of 3 units in $f(n)$, it follows that $f(1) - f(0) = 3$. Since $f(1) = -2$, it follows that $f(0) = f(1) - 3 = -5$. Therefore, the $y$-intercept of the graph of $f(n)$ is $-5$, and the slope-intercept equation for $f(n)$ is $f(n) = 3n - 5$.

Choices A, B, and D are incorrect because each equation has the incorrect slope of the line (the $y$-intercept in each equation is also incorrect).

## QUESTION 5.

**Choice B is correct.** Since 7 percent of the 562 juniors is 0.07(562) and 5 percent of the 602 seniors is 0.05(602), the expression 0.07(562) + 0.05(602) can be evaluated to determine the total number of juniors and seniors inducted into the honor society. Of the given choices, 69 is closest to the value of the expression.

Choice A is incorrect and may be the result of adding the number of juniors and seniors and the percentages given and then using the expression (0.07 + 0.05)(562 + 602). Choices C and D are incorrect and may be the result of finding either only the number of juniors inducted or only the number of seniors inducted.

## QUESTION 6.

**Choice A is correct.** The sum of the two polynomials is $(3x^2 - 5x + 2) + (5x^2 - 2x - 6)$. This can be rewritten by combining like terms:

$$(3x^2 - 5x + 2) + (5x^2 - 2x - 6) = (3x^2 + 5x^2) + (-5x - 2x) + (2 - 6) = 8x^2 - 7x - 4.$$

Choice B is incorrect and may be the result of a sign error when combining the coefficients of the $x$-term. Choice C is incorrect and may be the result of adding the exponents, as well as the coefficients, of like terms. Choice D is incorrect and may be the result of a combination of the errors described in B and C.

## QUESTION 7.

**Choice D is correct.** To solve the equation for $w$, multiply both sides of the equation by the reciprocal of $\frac{3}{5}$, which is $\frac{5}{3}$. This gives $\left(\frac{5}{3}\right) \cdot \frac{3}{5}w = \frac{4}{5} \cdot \left(\frac{5}{3}\right)$, which simplifies to $w = \frac{20}{9}$.

Choices A, B, and C are incorrect and may be the result of errors in arithmetic when simplifying the given equation.

## QUESTION 8.

**Choice C is correct.** In the equation $y = 0.56x + 27.2$, the value of $x$ increases by 1 for each year that passes. Each time $x$ increases by 1, $y$ increases by 0.56 since 0.56 is the slope of the graph of this equation. Since $y$ represents the average number of students per classroom in the year represented by $x$, it follows that, according to the model, the estimated increase each year in the average number of students per classroom at Central High School is 0.56.

Choice A is incorrect because the total number of students in the school in 2000 is the product of the average number of students per classroom and the total number of classrooms, which would appropriately be approximated by the $y$-intercept (27.2) times the total number of classrooms, which is not given. Choice B is incorrect because the average number of students per classroom in 2000 is given by the $y$-intercept of the graph of the equation, but the question is asking for the meaning of the number 0.56, which is the slope. Choice D is incorrect because 0.56 represents the estimated yearly change in the average number of students per classroom. The estimated difference between the average number of students per classroom in 2010 and 2000 is 0.56 times the number of years that have passed between 2000 and 2010, that is, $0.56 \times 10 = 5.6$.

## QUESTION 9.

**Choice B is correct.** Because Nate walks 25 meters in 13.7 seconds, and 4 minutes is equal to 240 seconds, the proportion $\frac{25 \text{ meters}}{13.7 \text{ sec}} = \frac{x \text{ meters}}{240 \text{ sec}}$ can be used to find out how many meters, $x$, Nate walks in 4 minutes. The proportion can be simplified to $\frac{25}{13.7} = \frac{x}{240}$, because the units of meters per second cancel, and then each side of the equation can be multiplied by 240, giving $\frac{(240)(25)}{13.7} = x \approx 438$. Therefore, of the given options, 450 meters is closest to the distance Nate will walk in 4 minutes.

Choice A is incorrect and may be the result of setting up the proportion as $\frac{13.7 \text{ sec}}{25 \text{ meters}} = \frac{x \text{ meters}}{240 \text{ sec}}$ and finding that $x \approx 132$, which is close to 150. Choices C and D are incorrect and may be the result of errors in calculation.

## QUESTION 10.

**Choice D is correct.** On Mercury, the acceleration due to gravity is 3.6 m/sec$^2$. Substituting 3.6 for $g$ and 90 for $m$ in the formula $W = mg$ gives $W = 90(3.6) = 324$ newtons.

Choice A is incorrect and may be the result of dividing 90 by 3.6. Choice B is incorrect and may be the result of subtracting 3.6 from 90 and rounding to the nearest whole number. Choice C is incorrect because an object with a weight of 101 newtons on Mercury would have a mass of about 28 kilograms, not 90 kilograms.

## QUESTION 11.

**Choice B is correct.** On Earth, the acceleration due to gravity is 9.8 m/sec$^2$. Thus, for an object with a weight of 150 newtons, the formula $W = mg$ becomes $150 = m(9.8)$, which shows that the mass of an object with a weight of 150 newtons on Earth is about 15.3 kilograms. Substituting this mass into the formula $W = mg$ and now using the weight of 170 newtons gives $170 = 15.3g$, which shows that the second planet's acceleration due to gravity is about 11.1 m/sec$^2$. According to the table, this value for the acceleration due to gravity holds on Saturn.

Choices A, C, and D are incorrect. Using the formula $W = mg$ and the values for $g$ in the table shows that an object with a weight of 170 newtons on these planets would not have the same mass as an object with a weight of 150 newtons on Earth.

## QUESTION 12.

**Choice D is correct.** A zero of a function corresponds to an $x$-intercept of the graph of the function in the $xy$-plane. Therefore, the complete graph of the function $f$, which has five distinct zeros, must have five $x$-intercepts. Only the graph in choice D has five $x$-intercepts, and therefore, this is the only one of the given graphs that could be the complete graph of $f$ in the $xy$-plane.

Choices A, B, and C are incorrect. The number of $x$-intercepts of each of these graphs is not equal to five; therefore, none of these graphs could be the complete graph of $f$, which has five distinct zeros.

## QUESTION 13.

**Choice D is correct.** Starting with the original equation, $h = -16t^2 + vt + k$, in order to get $v$ in terms of the other variables, $-16t^2$ and $k$ need to be subtracted from each side. This yields $vt = h + 16t^2 - k$, which when divided by $t$ will give $v$ in terms of the other variables. However, the equation $v = \frac{h + 16t^2 - k}{t}$ is not one of the options, so the right side needs to be further simplified. Another way to write the previous equation is $v = \frac{h - k}{t} + \frac{16t^2}{t}$, which can be simplified to $v = \frac{h - k}{t} + 16t$.

Choices A, B, and C are incorrect and may be the result of arithmetic errors when rewriting the original equation to express $v$ in terms of $h$, $t$, and $k$.

## QUESTION 14.

**Choice A is correct.** The hotel charges \$0.20 per minute to use the meeting-room phone. This per-minute rate can be converted to the hourly rate using the conversion 1 hour = 60 minutes, as shown below.

$$\frac{\$0.20}{\text{minute}} \times \frac{60 \text{ minutes}}{1 \text{ hour}} = \frac{\$(0.20 \times 60)}{\text{hour}}$$

Thus, the hotel charges $\$(0.20 \times 60)$ per hour to use the meeting-room phone. Therefore, the cost $c$, in dollars, for $h$ hours of use is $c = (0.20 \times 60)h$, which is equivalent to $c = 0.20(60h)$.

Choice B is incorrect because in this expression the per-minute rate is multiplied by $h$, the number of hours of phone use. Furthermore, the equation indicates that there is a flat fee of \$60 in addition to the per-minute or per-hour rate. This is not the case. Choice C is incorrect because the expression indicates that the hotel charges $\$\left(\frac{60}{0.20}\right)$ per hour for use of the meeting-room phone, not \$0.20(60) per hour. Choice D is incorrect because the expression indicates that the hourly rate is $\frac{1}{60}$ times the per-minute rate, not 60 times the per-minute rate.

## QUESTION 15.

**Choice A is the correct answer.** Experimental research is a method used to study a small group of people and generalize the results to a larger population. However, in order to make a generalization involving cause and effect:

- The population must be well defined.
- The participants must be selected at random.
- The participants must be randomly assigned to treatment groups.

When these conditions are met, the results of the study can be generalized to the population with a conclusion about cause and effect. In this study, all conditions are met and the population from which the participants were selected are people with poor eyesight. Therefore, a general conclusion can be drawn about the effect of Treatment X on the population of people with poor eyesight.

Choice B is incorrect. The study did not include all available treatments, so no conclusion can be made about the relative effectiveness of all available treatments. Choice C is incorrect. The participants were selected at random from a large population of people with poor eyesight. Therefore, the results can be generalized only to that population and not to anyone in general. Also, the conclusion is too strong: an experimental study might show that people are likely to be helped by a treatment, but it cannot show that anyone who takes the treatment will be helped. Choice D is incorrect.

This conclusion is too strong. The study shows that Treatment X is likely to improve the eyesight of people with poor eyesight, but it cannot show that the treatment definitely will cause improvement in eyesight for every person. Furthermore, since the people undergoing the treatment in the study were selected from people with poor eyesight, the results can be generalized only to this population, not to all people.

## QUESTION 16.

**Choice B is correct.** For any value of $x$, say $x = x_0$, the point $(x_0, f(x_0))$ lies on the graph of $f$ and the point $(x_0, g(x_0))$ lies on the graph of $g$. Thus, for any value of $x$, say $x = x_0$, the value of $f(x_0) + g(x_0)$ is equal to the sum of the $y$-coordinates of the points on the graphs of $f$ and $g$ with $x$-coordinate equal to $x_0$. Therefore, the value of $x$ for which $f(x) + g(x)$ is equal to 0 will occur when the $y$-coordinates of the points representing $f(x)$ and $g(x)$ at the same value of $x$ are equidistant from the $x$-axis and are on opposite sides of the $x$-axis. Looking at the graphs, one can see that this occurs at $x = -2$: the point $(-2, -2)$ lies on the graph of $f$, and the point $(-2, 2)$ lies on the graph of $g$. Thus, at $x = -2$, the value of $f(x) + g(x)$ is $-2 + 2 = 0$.

Choices A, C, and D are incorrect because none of these $x$-values satisfy the given equation, $f(x) + g(x) = 0$.

## QUESTION 17.

**Choice B is correct.** The quantity of the product supplied to the market is given by the function $S(P) = \frac{1}{2}P + 40$. If the price $P$ of the product increases by \$10, the effect on the quantity of the product supplied can be determined by substituting $P + 10$ for $P$ as the argument in the function. This gives $S(P + 10) = \frac{1}{2}(P + 10) + 40 = \frac{1}{2}P + 45$, which shows that $S(P + 10) = S(P) + 5$. Therefore, the quantity supplied to the market will increase by 5 units when the price of the product is increased by \$10.

Alternatively, look at the coefficient of $P$ in the linear function $S$. This is the slope of the graph of the function, where $P$ is on the horizontal axis and $S(P)$ is on the vertical axis. Since the slope is $\frac{1}{2}$, for every increase of 1 in $P$, there will be an increase of $\frac{1}{2}$ in $S(P)$, and therefore, an increase of 10 in $P$ will yield an increase of 5 in $S(P)$.

Choice A is incorrect. If the quantity supplied decreases as the price of the product increases, the function $S(P)$ would be decreasing, but $S(P) = \frac{1}{2}P + 40$ is an increasing function. Choice C is incorrect and may be the result of assuming the slope of the graph of $S(P)$ is equal to 1. Choice D is incorrect and may be the result of confusing the $y$-intercept of the graph of $S(P)$ with the slope, and then adding 10 to the $y$-intercept.

## QUESTION 18.

**Choice B is correct.** The quantity of the product supplied to the market will equal the quantity of the product demanded by the market if $S(P)$ is equal to $D(P)$, that is, if $\frac{1}{2}P + 40 = 220 - P$. Solving this equation gives $P = 120$, and so \$120 is the price at which the quantity of the product supplied will equal the quantity of the product demanded.

Choices A, C, and D are incorrect. At these dollar amounts, the quantities given by $S(P)$ and $D(P)$ are not equal.

## QUESTION 19.

**Choice C is correct.** It is given that 1 ounce of graphene covers 7 football fields. Therefore, 48 ounces can cover $7 \times 48 = 336$ football fields. If each football field has an area of $1\frac{1}{3}$ acres, than 336 football fields have a total area of $336 \times 1\frac{1}{3} = 448$ acres. Therefore, of the choices given, 450 acres is closest to the number of acres 48 ounces of graphene could cover.

Choice A is incorrect and may be the result of dividing, instead of multiplying, the number of football fields by $1\frac{1}{3}$. Choice B is incorrect and may be the result of finding the number of football fields, not the number of acres, that can be covered by 48 ounces of graphene. Choice D is incorrect and may be the result of setting up the expression $\frac{7 \times 48 \times 4}{3}$ and then finding only the numerator of the fraction.

## QUESTION 20.

**Choice B is correct.** To answer this question, find the point in the graph that represents Michael's 34-minute swim and then compare the actual heart rate for that swim with the expected heart rate as defined by the line of best fit. To find the point that represents Michael's swim that took 34 minutes, look along the vertical line of the graph that is marked "34" on the horizontal axis. That vertical line intersects only one point in the scatterplot, at 148 beats per minute. On the other hand, the line of best fit intersects the vertical line representing 34 minutes at 150 beats per minute. Therefore, for the swim that took 34 minutes, Michael's actual heart rate was $150 - 148 = 2$ beats per minute less than predicted by the line of best fit.

Choices A, C, and D are incorrect and may be the result of misreading the scale of the graph.

## QUESTION 21.

**Choice C is correct.** Let $I$ be the initial savings. If each successive year, 1% of the current value is added to the value of the account, then after 1 year, the amount in the account will be $I + 0.01I = I(1 + 0.01)$; after 2 years, the amount in the account will be $I(1 + 0.01) + 0.01I(1 + 0.01) = (1 + 0.01)I(1 + 0.01) = I(1 + 0.01)^2$; and after $t$ years, the amount in the account will be $I(1 + 0.01)^t$. This is exponential growth of the money in the account.

Choice A is incorrect. If each successive year, 2% of the initial savings, $I$, is added to the value of the account, then after $t$ years, the amount in the account will be $I + 0.02It$, which is linear growth. Choice B is incorrect. If each successive year, 1.5% of the initial savings, $I$, and \$100 is added to the value of the the account, then after $t$ years the amount in the account will be $I + (0.015I + 100)t$, which is linear growth. Choice D is incorrect. If each successive year, \$100 is added to the value of the account, then after $t$ years the amount in the account will be $I + 100t$, which is linear growth.

## QUESTION 22.

**Choice B is correct.** One of the three numbers is $x$; let the other two numbers be $y$ and $z$. Since the sum of three numbers is 855, the equation $x + y + z = 855$ is true. The statement that $x$ is 50% more than the sum of the other two numbers can be represented as $x = 1.5(y + z)$, or $\frac{x}{1.5} = y + z$. Substituting $\frac{x}{1.5}$ for $y + z$ in $x + y + z = 855$ gives $x + \frac{x}{1.5} = 855$. This last equation can be rewritten as $x + \frac{2x}{3} = 855$, or $\frac{5x}{3} = 855$. Therefore, $x$ equals $\frac{3}{5} \times 855 = 513$.

Choices A, C, and D are incorrect and may be the result of calculation errors.

## QUESTION 23.

**Choice C is correct.** Since the angles are acute and $\sin(a°) = \cos(b°)$, it follows from the complementary angle property of sines and cosines that $a + b = 90$. Substituting $4k - 22$ for $a$ and $6k - 13$ for $b$ gives $(4k - 22) + (6k - 13) = 90$, which simplifies to $10k - 35 = 90$. Therefore, $10k = 125$, and $k = 12.5$.

Choice A is incorrect and may be the result of mistakenly assuming that $a + b$ and making a sign error. Choices B and D are incorrect because they result in values for $a$ and $b$ such that $\sin(a°) \neq \cos(b°)$.

## QUESTION 24.

**Choice D is correct.** Let $c$ be the number of students in Mr. Kohl's class. The conditions described in the question can be represented by the equations $n = 3c + 5$ and $n + 21 = 4c$. Substituting $3c + 5$ for $n$ in the second equation gives $3c + 5 + 21 = 4c$, which can be solved to find $c = 26$.

Choices A, B, and C are incorrect because the values given for the number of students in the class cannot fulfill both conditions given in the question. For example, if there were 16 students in the class, then the first condition would imply that there are 3(16) + 5 = 53 milliliters of solution in the beaker, but the second condition would imply that there are 4(16) − 21 = 43 milliliters of solution in the beaker. This contradiction shows that there cannot be 16 students in the class.

## QUESTION 25.

**Choice D is correct.** The volume of the grain silo can be found by adding the volumes of all the solids of which it is composed. The silo is made up of a cylinder with height 10 feet (ft) and base radius 5 feet and two cones, each having height 5 ft and base radius 5 ft. The formulas $V_{\text{cylinder}} = \pi r^2 h$ and $V_{\text{cone}} = \frac{1}{3}\pi r^2 h$ can be used to determine the total volume of the silo. Since the two cones have identical dimensions, the total volume, in cubic feet, of the silo is given by $V_{\text{silo}} = \pi(5)^2(10) + (2)\left(\frac{1}{3}\right)\pi(5)^2(5) = \left(\frac{4}{3}\right)(250)\pi$, which is approximately equal to 1,047.2 cubic feet.

Choice A is incorrect because this is the volume of only the two cones. Choice B is incorrect because this is the volume of only the cylinder. Choice C is incorrect because this is the volume of only one of the cones plus the cylinder.

## QUESTION 26.

**Choice C is correct.** The line passes through the origin, (2, $k$), and ($k$, 32). Any two of these points can be used to find the slope of the line. Since the line passes through (0, 0) and (2, $k$), the slope of the line is equal to $\frac{k-0}{2-0} = \frac{k}{2}$. Similarly, since the line passes through (0, 0) and ($k$, 32), the slope of the line is equal to $\frac{32-0}{k-0} = \frac{32}{k}$. Since each expression gives the slope of the same line, it must be true that $\frac{k}{2} = \frac{32}{k}$. Multiplying each side of $\frac{k}{2} = \frac{32}{k}$ by $2k$ gives $k^2 = 64$, from which it follows that $k = 8$ or $k = -8$. Therefore, of the given choices, only 8 could be the value of $k$.

Choices A, B, and D are incorrect and may be the result of calculation errors.

## QUESTION 27.

**Choice C is correct.** Let $\ell$ and $w$ be the length and width, respectively, of the original rectangle. The area of the original rectangle is $A = \ell w$. The rectangle is altered by increasing its length by 10 percent and decreasing its width by $p$ percent; thus, the length of the altered rectangle is $1.1\ell$, and the width of the altered rectangle is $\left(1 - \frac{p}{100}\right)w$. The alterations decrease the area by 12 percent, so the area of the altered rectangle is $(1 - 0.12)A = 0.88A$.

The altered rectangle is the product of its length and width, so $0.88A = (1.1\ell)\left(1 - \frac{p}{100}\right)w$. Since $A = \ell w$, this last equation can be rewritten as $0.88A = (1.1)\left(1 - \frac{P}{100}\right)\ell w = (1.1)\left(1 - \frac{P}{100}\right) A$, from which it follows that $0.88 = (1.1)\left(1 - \frac{P}{100}\right)$, or $0.8 = \left(1 - \frac{P}{100}\right)$. Therefore, $\frac{P}{100} = 0.2$, and so the value of $p$ is 20.

Choice A is incorrect and may be the result of confusing the 12 percent decrease in area with the percent decrease in width. Choice B is incorrect because decreasing the width by 15 percent results in a 6.5 percent decrease in area, not a 12 percent decrease. Choice D is incorrect and may be the result of adding the percents given in the question (10 + 12).

## QUESTION 28.

**Choice D is correct.** For the present population to decrease by 10 percent, it must be multiplied by the factor 0.9. Since the engineer estimates that the population will decrease by 10 percent every 20 years, the present population, 50,000, must be multiplied by $(0.9)^n$, where $n$ is the number of 20-year periods that will have elapsed $t$ years from now. After $t$ years, the number of 20-year periods that have elapsed is $\frac{t}{20}$. Therefore, $50{,}000(0.9)^{\frac{t}{20}}$ represents the engineer's estimate of the population of the city $t$ years from now.

Choices A, B, and C are incorrect because each of these choices either confuses the percent decrease with the multiplicative factor that represents the percent decrease or mistakenly multiplies $t$ by 20 to find the number of 20-year periods that will have elapsed in $t$ years.

## QUESTION 29.

**Choice A is correct.** Let $x$ be the number of left-handed female students and let $y$ be the number of left-handed male students. Then the number of right-handed female students will be $5x$ and the number of right-handed male students will be $9y$. Since the total number of left-handed students is 18 and the total number of right-handed students is 122, the system of equations below must be satisfied.

$$\begin{cases} x + y = 18 \\ 5x + 9y = 122 \end{cases}$$

Solving this system gives $x = 10$ and $y = 8$. Thus, 50 of the 122 right-handed students are female. Therefore, the probability that a right-handed student selected at random is female is $\frac{50}{122}$, which to the nearest thousandth is 0.410.

Choices B, C, and D are incorrect and may be the result of incorrect calculation of the missing values in the table.

## QUESTION 30.

**Choice A is correct.** Subtracting the sides of $3y + c = 5y - 7$ from the corresponding sides of $3x + b = 5x - 7$ gives $(3x - 3y) + (b - c) = (5x - 5y)$. Since $b = c - \frac{1}{2}$, or $b - c = -\frac{1}{2}$, it follows that $(3x - 3y) + \left(-\frac{1}{2}\right) = (5x - 5y)$. Solving this equation for $x$ in terms of $y$ gives $x = y - \frac{1}{4}$. Therefore, $x$ is $y$ minus $\frac{1}{4}$.

Choices B, C, and D are incorrect and may be the result of making a computational error when solving the equations for $x$ in terms of $y$.

## QUESTION 31.

**The correct answer is either 4 or 5**. Because each student ticket costs \$2 and each adult ticket costs \$3, the total amount, in dollars, that Chris spends on $x$ student tickets and 1 adult ticket is $2(x) + 3(1)$. Because Chris spends at least \$11 but no more than \$14 on the tickets, one can write the compound inequality $2x + 3 \geq 11$ and $2x + 3 \leq 14$. Subtracting 3 from each side of both inequalities and then dividing each side of both inequalities by 2 yields $x \geq 4$ and $x \leq 5.5$. Thus, the value of $x$ must be an integer that is both greater than or equal to 4 and less than or equal to 5.5. Therefore, $x = 4$ or $x = 5$. Either 4 or 5 may be gridded as the correct answer.

## QUESTION 32.

**The correct answer is 58.6.** The mean of a data set is determined by calculating the sum of the values and dividing by the number of values in the data set. The sum of the ages, in years, in the data set is 703, and the number of values in the data set is 12. Thus, the mean of the ages, in years, of the first 12 United States presidents at the beginning of their terms is $\frac{703}{12}$. The fraction $\frac{703}{12}$ cannot be entered into the grid, so the decimal equivalent, rounded to the nearest tenth, is the correct answer. This rounded decimal equivalent is 58.6.

## QUESTION 33.

**The correct answer is 9.** To rewrite the difference $(-3x^2 + 5x - 2) - 2(x^2 - 2x - 1)$ in the form $ax^2 + bx + c$, the expression can be simplified by using the distributive property and combining like terms as follows:

$(-3x^2 + 5x - 2) - (2x^2 - 4x - 2)$

$(-3x^2 - 2x^2) + (5x - (-4x)) + (-2 - (-2))$

$-5x^2 + 9x + 0$

The coefficient of $x$ is the value of $b$, which is 9.

Alternatively, since $b$ is the coefficient of $x$ in the difference $(-3x^2 + 5x - 2) - 2(x^2 - 2x - 1)$, one need only compute the $x$-term in the difference. The $x$-term is $5x - 2(-2x) = 5x + 4x = 9x$, so the value of $b$ is 9.

## QUESTION 34.

**The correct answer is $\frac{5}{8}$ or .625.** A complete rotation around a point is 360° or $2\pi$ radians. Since the central angle $AOB$ has measure $\frac{5\pi}{4}$ radians, it represents $\frac{\frac{5\pi}{4}}{2\pi} = \frac{5}{8}$ of a complete rotation around point $O$. Therefore, the sector formed by central angle $AOB$ has area equal to $\frac{5}{8}$ the area of the entire circle. Either the fraction $\frac{5}{8}$ or its decimal equivalent, .625, may be gridded as the correct answer.

## QUESTION 35.

**The correct answer is 50.** The mean of a data set is the sum of the values in the data set divided by the number of values in the data set. The mean of 75 is obtained by finding the sum of the first 10 ratings and dividing by 10. Thus, the sum of the first 10 ratings was 750. In order for the mean of the first 20 ratings to be at least 85, the sum of the first 20 ratings must be at least $(85)(20) = 1700$. Therefore, the sum of the next 10 ratings must be at least $1700 - 750 = 950$. The maximum rating is 100, so the maximum possible value of the sum of the 12th through 20th ratings is $9 \times 100 = 900$. Therefore, for the store to be able to have an average of at least 85 for the first 20 ratings, the least possible value for the 11th rating is $950 - 900 = 50$.

## QUESTION 36.

**The correct answer is 750.** The inequalities $y \leq -15x + 3000$ and $y \leq 5x$ can be graphed in the $xy$-plane. They are represented by the half-planes below and include the boundary lines $y = -15x + 3000$ and $y = 5x$, respectively. The solution set of the system of inequalities will be the intersection of these half-planes, including the boundary lines, and the solution $(a, b)$ with the greatest possible value of $b$ will be the point of intersection of the boundary lines. The intersection of boundary lines of these inequalities can be found by setting them equal to each other: $5x = -15x + 3000$, which has solution $x = 150$. Thus, the $x$-coordinate of the point of intersection is 150. Therefore, the $y$-coordinate of the point of intersection of the boundary lines is $5(150) = -15(150) + 3000 = 750$. This is the maximum possible value of $b$ for a point $(a, b)$ that is in the solution set of the system of inequalities.

## QUESTION 37.

**The correct answer is 7.** The average number of shoppers, $N$, in the checkout line at any time is $N = rt$, where $r$ is the number of shoppers entering the checkout line per minute and $T$ is the average number of minutes each shopper spends in the checkout line. Since 84 shoppers per hour make a purchase, 84 shoppers per hour enter the checkout line. This needs to be converted to the number of shoppers per minute. Since there are 60 minutes in one hour, the rate is $\frac{84 \text{ shoppers}}{60 \text{ minutes}} = 1.4$ shoppers per minute. Using the given formula with $r = 1.4$ and $t = 5$ yields $N = rt = (1.4)(5) = 7$. Therefore, the average number of shoppers, $N$, in the checkout line at any time during business hours is 7.

## QUESTION 38.

**The correct answer is 60.** The estimated average number of shoppers in the original store at any time is 45. In the new store, the manager estimates that an average of 90 shoppers per hour enter the store, which is equivalent to 1.5 shoppers per minute. The manager also estimates that each shopper stays in the store for an average of 12 minutes. Thus, by Little's law, there are, on average, $N = rt = (1.5)(12) = 18$ shoppers in the new store at any time. This is $\frac{45 - 18}{45} \times 100 = 60$ percent less than the average number of shoppers in the original store at any time.