



AMERICA'S PREMIERE TESTING READINESS PROGRAM

# PSAT/NMSQT® (Form Code 16PS02)



## *Cambridge Navigator Plus: The Complete Explanation Guide to the Retired Test*

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## 5 Ways to Increase Score Gains Using Cambridge's *Navigator Plus*

*Navigator Plus* is Cambridge's complete explanation guide to a previously administered test. It includes explanations for each item on the test, categorization for each item, an answer key, and more.

The following list provides suggestions for implementing the Navigator into your program to increase score gains.

1. **Simulate test day as much as possible when proctoring tests.** Students will benefit from a testing experience that closely simulates what they will experience on test day. They will feel more confident if they know what to expect.
2. **Follow up when you receive your data.** Use the reports you receive from Cambridge to cover the items your class struggled as a group to answer (see the Error Analysis report). Taking this step within two weeks of administering the test will ensure that your students haven't forgotten the items you cover and will be able to learn from their testing experiences.
3. **Use the Pre-Assessment Item references in the *Victory* lesson to illustrate key points.** Your teacher's guide includes references to items on your pre-assessment that you can use as additional examples. Keep a copy of your pre-assessment test booklet handy so that you can cover these items with your students. Using pre-assessment items as additional examples helps students connect the concepts you are teaching with their test-day experiences.
4. **Don't forget to review the wrong answers.** Many explanations in this Navigator packet include references to each wrong answer choice. Students will benefit from reviewing why each wrong answer is wrong so that they can recognize what makes the right answer correct and use the process of elimination to eliminate similar wrong answers in the future.
5. **Pay attention to item categories.** Each item in this Navigator packet includes a category path that corresponds to the course concept outline in your *Victory* text as well as the categories listed in the Item Index of your *Victory* text. Use the Item Index to identify items students can use for further practice.

## Category Paths

Throughout these explanations, each item is categorized. Each explanation includes a **Cambridge Category Path** which links the item to the Course Concept Outline in Cambridge's *Victory* series. For example:

***Math: Multiple-Choice/Geometry/Triangles/Pythagorean Theorem***

An item with this particular category path is found in the Math Test (these items have a Level 1 label of “Math: Multiple-Choice” or “Math: Student-Produced Response”) and tests students’ knowledge of geometry (Level 2 of the category path), more specifically of triangles (Level 3), and even more specifically of the Pythagorean theorem (Level 4). The *Victory* Math Lessons include a section on the Pythagorean theorem, which you can find by referencing the Course Concept Outline at the beginning of the mathematics section in the *Victory* book. Additionally, you can find items testing geometry, triangles, or the Pythagorean theorem using the Item Index at the end of the *Victory* Student Text and Teacher’s Guide.



## READING TEST EXPLANATIONS

1. **(A) Reading/Literary Fiction/Implied Idea.** At the beginning of the passage, Falvo gives several commands to take it easy: “...stay contained, stay smooth” (line 15); “[p]ace yourself” (line 24); and “[g]o out slow, feel your way” (lines 25–26), so (A) is the best answer. (B) is incorrect because McCann is described as a “tough-looking” kid who gets a specific warning to not overdo it (lines 14–17), which implies that he is the type of person who pushes limits, not stays within them. (C) is clearly wrong because Mosher pushes himself so far he makes himself sick, and (D) is wrong because the person who says “Let him go” has already finished and “recovered,” which implies he had pushed his own limits as well.
2. **(B) Reading/Literary Fiction/Evidence.** This question asks for textual evidence to support the correct answer to the previous question. This support can be found in lines 19–22 where Falvo is warning Mosher, the newest runner, not to overdo it, (B). While lines 14–17 deal with the need to not “drain the well,” they do not address the idea of “trying something new”—a component of the previous question—as McCann is an experienced runner, so (A) is wrong. (C) and (D) are also wrong because these lines detail the result of Mosher pushing past his limits.
3. **(B) Reading/Literary Fiction/Development.** In the fifth paragraph, Falvo gives instructions to all runners to not “drain the well”; his specific instructions to the newest runner, Mosher, in lines 24–27 are an emphasis and elaboration of these guidelines, (B). Both (A) and (C) are incorrect because they deal with general instructions or ideas about running, and Falvo is specifying earlier instructions, not generalizing them. (D) is wrong because Falvo’s guidelines don’t reveal any information about his motivations.
4. **(B) Reading/Literary Fiction/Vocabulary.** This question asks about lines where Mosher, the new runner who pushes himself past his limits, responds to Falvo’s instructions and warnings. While Mosher’s responses show that he heard Falvo, his blatant disregard to those warnings by making himself sick shows that he dismissed them, (B). Nothing in the passage, overall and in his responses to Falvo, supports Mosher being described as shy, (A); dishonest, (C); or hostile, (D).
5. **(C) Reading/Literary Fiction/Explicit Detail.** Falvo’s instructions to the runners do not garner a response, but as they set out their running is described as “quiet” and “sustained” (lines 38–39) and “smooth as water” (line 42), showing they were not exerting themselves and accepted his advice, (C). The lack of response eliminates any enthusiasm, so (A) is wrong. And, because there is no initial response to Falvo’s advice, it appears that the runners didn’t hear him, but their actions show that they did and that they accepted the advice, so (B) and (D) are also wrong.
6. **(D) Reading/Literary Fiction/Explicit Detail.** This is an Explicit Detail item that asks for something specifically stated in the passage. In line 61, in the height of his effort to finish the run, the narrator states that he doesn’t “know why” and “can’t explain it,” (D). The narrator watched as other runners lapped him, so (A) is wrong. While he is a new runner and ignores warnings from Falvo, it is reasonable to assume that the narrator has something to prove, (B), but it is not a detail explicitly stated in the passage. As for (C), the narrator is a new runner, so he has no previous time to try to beat.
7. **(B) Reading/Literary Fiction/Evidence.** As indicated in the explanation to the previous question, the narrator states that he can’t explain why he continues to run in line 61, (B). Lines 36–39 describe the other, more experienced runners, so (A) is wrong. Lines 73–76 detail the narrator falling into Falvo, and lines 91–94 are Falvo’s critique of the narrator pushing himself too far, so (C) and (D) are also wrong.
8. **(A) Reading/Literary Fiction/Implied Idea.** In the context of the passage, Falvo repeats his earlier instructions to Mosher to “stay within [him]self,” or to not push past his limits, so the phrase “don’t drain the well” likely means “don’t use up all of your energy,” (A). (B) is wrong because the phrase means not to use up energy, not “don’t get sick.” And, (C) and (D) are wrong because throughout the

passage Falvo instructs Mosher to not worry about the other runners (lines 20–22) and to finish the best he can (line 27).

9. **(D) Reading/Literary Fiction/Vocabulary.** In line 89, Falvo is talking to Mosher after he pushed himself so hard that he threw up. Falvo gave several warnings to Mosher (which were ignored) throughout the passage to stay within his limits in an effort to avoid this outcome, so the “bitter” laugh that demonstrates Falvo’s “vindication” most likely means that he has been proven right, (D). (A) is wrong because “avenge” means to “take vengeance” and Falvo has not tried to take anything. Falvo is also not being “set free” from anything (B), nor is he defending himself against anything, (D).
10. **(A) Reading/Social Studies/Main Idea.** The first part of the passage addresses the increase in democracies worldwide, but in line 23 the focus shifts with a question: “What caused this global transformation?” The rest of the passage analyzes the possible causes for the increase in democracies, so the best answer choice is (A). The passage consistently argues, through examples of democracies and failed autocracies, that there is more political openness in the world, and not less, so (B) is wrong. The passage does not move from an explanation of one set of data to the next; it moves from data to analysis, so (C) is wrong. As for (D), the passage doesn’t advocate or denounce democracy or autocracy, so it is also wrong.
11. **(D) Reading/Social Studies/Vocabulary.** Lines 12–20 provide long-winded and data-specific detail on the proportion of democracies. The last sentence of the second paragraph gives the same information but in a way that states the gist of the detail provided earlier in the paragraph. “Impose” means “to establish” or “force,” which is not the right word to introduce the simpler version of the facts provided, so (A) is wrong. The facts are also not being “arranged” or “put” somewhere, so “placed,” (B) isn’t the right word to introduce them either. And the facts are not being “moved to action” or “incited” so (C) is also wrong. Only (D) uses “stated” to show that the same information provided previously is being “stated” or “put” in a simpler format.
12. **(D) Reading/Social Studies/Vocabulary.** In this section, details about Western governments’ encouragement for reform is provided. Because they are promoting “dissent” or rebellion, they are “offering” or “holding out” rewards for the taking to governments who also “dissent,” (D). “Awaiting” a reward wouldn’t provide much motivation for others to rebel or dissent, so (B) is wrong. “Resisted” means to “withstand” and “avoid” means to “keep away from”—both of which have negative connotations. In this section, the “rewards”—something positive, not negative—are being held out, so both (A) and (C) are wrong.
13. **(D) Reading/Social Studies/Evidence.** This question asks for the textual evidence that best supports the claim that political openness is a widespread trend. This is a detail not easily recalled, so it makes most sense to plug in the answers to test against the claim. Line 23 is a question, which means it can’t be support for the claim, so (A) can be eliminated. Lines 26–27 show that poor management of authoritarian governments created unrest, and it can be inferred that this led to political openness, but it is not explicitly stated, so (B) is wrong. Lines 41–42 attribute digital culture as a factor for the spread of political openness, but it is only one specific factor, so (C) is also wrong. That leaves (D); lines 56–59 cite a study that deals with the world’s democratic electoral system—a study that found that only one country hasn’t put down electoral freedom roots, which means political openness is popular worldwide—providing the best evidence for the claim.
14. **(A) Reading/Social Studies/Explicit Detail.** This question asks for specific detail from the passage about how autocratic governments are responding to the increase in political openness. The first sentence of the last paragraph states this plainly: “Even autocracies are less autocratic.” The paragraph goes on to explain that autocratic governments are not suppressing freedom or political competition, (A). (B) is wrong because lines 59–63 explicitly state that the opposite is true: Autocratic governments are becoming more, not less, democratic. The passage makes no mention of setbacks, so (C) is wrong. As for



- (D), the last paragraph clearly states that political openness worldwide is increasing, and not on the decline.
15. **(C) Reading/Social Studies/Evidence.** As indicated in the explanation to the previous question, the last paragraph provides explicit evidence to show that autocratic governments are embracing political openness. The most detailed explanation of this is found in lines 59–63, (C). Lines 18–22 are concerned with the increase in democracies, but do not deal with autocracies, so (A) is wrong. Lines 46–50 deal with the exception to the democratic and political openness growth so (B) is wrong, and lines 73–77 detail the specific time period where the democratic shift occurred, so (D) is also wrong.
16. **(B) Reading/Social Studies/Explicit Detail.** The last paragraph cites several factors, other than elections, that are central to political openness: 1) freedom of the press; 2) civil liberties; and 3) checks and balances. The only answer choice that matches one of these factors is (B), freedom of the press.
17. **(D) Reading/Social Studies/Data Presentation.** The graph provides a visual measurement of the number of democracies vs. autocracies between 1950 and 2011. In 1975 there were approximately 90 autocratic governments. In 1950 there were about 20 democracies, which shows there were more autocratic governments in 1975 than democratic governments in 1950, so (A) can be eliminated. In 1995 roughly 40 countries had a democratic government, so (B) is wrong. There were just under 100 democracies in 2011, more than the 90 autocratic governments in 1975, so (C) is also wrong. Only (D) represents the data found in the graph.
18. **(B) Reading/Social Studies/Data Presentation.** This question asks for the year range when the number of autocracies and democracies are close to equal. The lines that represent each type of government meet between 1985–1990, showing that they were fairly equal in number, (B). According to the graph, between 1975–1980 there were more autocracies than democracies, so (A) is wrong. (C) is wrong because there were at least 60 more democracies than autocracies between 1995–2000, and (D) is wrong because 2005–2010 shows the greatest discrepancy in the number of autocracies vs. democracies.
19. **(A) Reading/Natural Sciences/Main Idea.** This is a Main Idea item that asks you to select the answer choice that best describes the main point of the passage. The first paragraph states the passage’s purpose: The “reintroduction of the gray wolf to Yellowstone National Park has boosted an important food source for the grizzly bear.” The study the author uses as a source is a “tale of who eats what,” an ecological phenomenon, (A). (B) is wrong because the study is used to explain how the wolves have impacted various plant and animal species, not to analyze the study. (C) is wrong because how wolves specifically impact ecology is not a debate, and (D) is wrong because the ecological impact of the reintroduction of the wolves is centered in science, not a historic discovery.
20. **(C) Reading/Natural Sciences/Explicit Detail.** Lines 8–15 state that when the elk population dropped “over-browsed plants began to rebound, including berry-producing shrubs,” which means there was an increase in fruit-producing plants, (C). While the passage does deal with the study of the ecology of Yellowstone, neither the study nor any other investigation, is mentioned as a result of the drop in elk population, so (A) is wrong. Lines 41–44 state that there was an increase in trees—including aspen—not a decrease, so (B) is wrong. And (D) is wrong because the passage states that the addition of wolves resulted in the decrease in elk, not the other way around.
21. **(B) Reading/Natural Sciences/Evidence.** As indicated in the explanation to the previous question, lines 12–15 state that when the elk population dropped, the number of fruit-producing plants increased, (B). Lines 6–7 introduce the study, not give a result of the decrease in elk, so (A) is wrong. Lines 42–46 identify a result of a decrease in the elk population, an increase in the number of trees, but these lines don’t support the correct answer to the previous question, so (C) is wrong. Lines 49–50 quote Ripple, but the quote simply says that they let nature “take its course” by adding wolves back into the environment; it doesn’t provide a result of the study, so (D) is also wrong.

22. **(D) Reading/Natural Sciences/Explicit Detail.** Lines 50–53 cite a specific challenge to the survival of the grizzly bear: The decrease in whitebark pine nuts from whitebark pine trees, which have been “dying en masse,” (D). Choices (A) and (C) are wrong because the passage doesn’t attribute elk or cottonwood trees as a challenge to grizzly bear survival. Rather, the passage states that cottonwood trees increased when elk population decreased, but neither of these details is tied to a shortage that threatens grizzly bears. As for (B), while beetles are cited as the cause of the decrease in whitebark pine trees, they are not the “shortage” mentioned in the question.
23. **(B) Reading/Natural Sciences/Evidence.** Lines 50–53 state the specific shortage that threatens grizzly bear survival: a loss of whitebark pine nuts, (B). Lines 27–30 state that scat in fruit increased when wolves were reintroduced to the park, but doesn’t mention a threat to grizzly bear survival, so (A) is wrong. Ripple’s warning that it will take time for berry-producing shrubs to regrow is highlighted in lines 59–60, but this also doesn’t point to a shortage that threatens grizzly bears; in fact, it is a food that bears can now supplement the shortage of pine nuts with, so (C) is wrong. And (D) is wrong because it states that while the bears can eat the fruit-bearing shrubs, it isn’t a cure-all for the shortage of pine nuts that threaten their survival.
24. **(D) Reading/Natural Sciences/Vocabulary.** “Browsed” in line 10 is used to refer to the eating habits of elk. The wolves preyed on elk who “browsed” on trees and shrubs, meaning the elk ate trees and shrubs. “Inspected,” (A); “skimmed,” (B); and “destroyed,” (C) are not words that correctly show what and how the elks ate. The elks “grazed” or “nibbled” on trees and shrubs, (D).
25. **(C) Reading/Natural Sciences/Implied Idea.** This question asks for a figurative phrase to be interpreted. In context of lines 60–62, the fruit-bearing shrubs are listed as an additional food source for grizzly bears, but are not a “panacea” or “cure-all” to the shortage problem created by the decrease in whitebark pine nuts. “Panacea” and “big silver bullet” are parallel items, as indicated by the conjunction “or” that separates them. The answer choice that is most closely associated with “panacea” is (C), “definitive solution.” None of the other answer choices match “panacea” and thus would create unclear or contradictory meaning.
26. **(B) Reading/Natural Sciences/Main Idea.** The main idea of the last paragraph can be found in Ripple’s idea that there may be more “far-reaching effects” or implications that haven’t yet been explored and that may affect other parts of the ecosystem, (B). (A) is wrong because the passage ends by stating Ripple’s ideas, not warning the reader of the limitations of his ideas. (C) is wrong because there is no mention of a new, specific experiment in the last paragraph. And, while Ripple’s warnings that there may be other effects that need to be explored can be seen as a potential ramification, that would be an inferred idea, not one that is stated in the last paragraph, so (D) is also wrong.
27. **(B) Reading/Natural Sciences/Data Presentation.** The last column in the chart shows the wolf to elk ratio. From 1986–1997, there is no fluctuation in ratio, but starting in 1998, numbered ratios become available. Between the years 1999 and 2000, the ratio decreased from 4.09 to 3.03, (B). (A), (C), and (D) are wrong because the ratio between those years shows an increase, not a decrease.
28. **(A) Reading/Natural Sciences/Data Presentation.** This question asks for a correct reading of the chart, and all answer choices deal with the number of elk compared to the number of wolves, so the correct answer can be found in a comparison of numbers in the column marked “Winter elk count” and the column marked “Wolf count.” The wolf count remains at zero until 1995, and in 1996 and 1997 the number of elk aren’t available, so the comparison of the columns starts in 1998. From 1998–2004, there was an overall increase in the number of wolves (32 in 1998 vs. 106 in 2004) and an overall decrease in the number of elk (11,736 in 1998 vs. 8,335 in 2004), so the correct answer is (A). While there was an overall decline of elk with an increase in wolves, there was not a decrease every year, or any given year, as the chart shows that 2000 saw an increase in elk and a decrease in wolves, so (B) and (C) are wrong. And (D) is wrong because the chart shows an overall decline of elk and an increase in wolves, not a stabilization of the two.





29. **(D) Reading/Social Studies/Vocabulary.** Line 22 refers to “[s]uch” men who do not exercise their moral judgment. These men, the author claims, “command” or “deserve” no more respect than a “lump of dirt,” (D). “Order” in this context would mean that these men have authority to “order” respect, but, because they are being compared with dirt, they would not have any authority to order anything, so (A) is wrong. “Dominate” also implies that these men have authority, and the opposite point is being made, so (B) is wrong. “Overlooked” means “to look past,” and the men in question aren’t “overlooking” respect; they don’t deserve it, so (C) is also wrong.
30. **(B) Reading/Social Studies/Explicit Detail.** Thoreau, throughout the passage, emphasizes the idea that men who are ruled by their conscience, not their mind, are at odds with those who rule and serve with their heads, including “legislators, politicians, ... office holders” (lines 26–27)—all members of government, (B). (A) is wrong because Thoreau claims that those who operate with their heads, not their conscience, are the ones who band together to make corporations. Both (C) and (D) are wrong because there is no evidence in the passage to suggest that those who lead with their conscience believe this trait makes them human or that they hold legislators to a different moral standard.
31. **(D) Reading/Social Studies/Evidence.** The end of the second paragraph, lines 30–34, states the fate of “moral” men who lead with their conscience: They are “commonly treated as enemies,” (D). In lines 1–2, Thoreau is asking if men must submit their conscience to legislators, but this section does not provide any evidence to show how the relationship between these men and government is antagonistic, so (A) is wrong. Lines 7–10 state that corporations have no conscience while the men who make up the corporation do, but this also doesn’t provide evidence to the antagonistic nature between moral men and legislators, so (B) is wrong. And, lines 17–20 describe the men who use their heads, not their conscience, so (C) is also wrong.
32. **(A) Reading/Social Studies/Explicit Detail.** King makes the distinction between just laws (laws that “square” with the moral law or the law of God) and unjust laws (laws that are “out of harmony” with the moral law) therefore, unjust laws have no moral authority, (A). Furthermore, King agrees with St. Augustine that “an unjust law is no law at all” (lines 54–55). King doesn’t argue that breaking an unjust law should or should not be done to attract attention, so (B) is wrong. And, there is nothing in the passage to support the ideas that unjust laws negatively affect the human spirit or that they should be used to provoke obedience to moral law, so (C) and (D) are also wrong.
33. **(C) Reading/Social Studies/Evidence.** As the explanation to the previous question indicates, the answer to this question can be found in lines 53–55 where King says that unjust laws should be disobeyed and are “no laws at all,” (C). Lines 49–50 introduce the idea of two types of laws but do not provide any information on what should or should not be done about either, so (A) is wrong. Lines 51–52 are questions, which King answers later in the paragraph, about how to tell the difference between just and unjust laws, but they also provide no information on what should or shouldn’t be done about either, so (B) is wrong. As for (D), lines 64–65 describe “any” law that is degrading to human personality as unjust, but they do not provide any information about how people should respond to those laws.
34. **(A) Reading/Social Studies/Vocabulary.** In line 57 King is asking how to determine or distinguish a just law from an unjust law. The answer choice that most closely fits “determine” or “distinguish” is “establish,” (A). “Regulate” means “to govern”; “direct” means “to mark” or “to regulate”; and “limit” means to “restrict”—none of which portray the distinction between one type of law or another, so (B), (C), and (D) are all wrong.
35. **(A) Reading/Social Studies/Main Idea.** This question asks for the main idea of both passages. In Passage 1 Thoreau advocates for men to be led by their conscience, even though that makes them “enemies” to the law. According to Thoreau, men of morals should have nothing to do with the law to avoid disgrace. King presents similar ideas. He distinguishes between just laws, which should be followed, and unjust laws, which should be broken as they are not moral. Both these ideas pit the individual against the government in a certain capacity or present an argument about the relationship between law and

individuals, (A). While both authors are concerned with unjust laws, they encourage people to break those laws, not offer ideas on how laws could be made more just, so (A) is wrong. Neither passage discusses the role of consequences in moral actions nor a change in government's control over the individual, so both (C) and (D) are also wrong.

36. **(C) Reading/Social Studies/Application.** This question asks for the best answer that captures how both authors feel about people who follow all laws. Thoreau calls those who follow government “wooden men” who deserve “no more respect” than “a lump of dirt” (lines 20–23). King makes the distinction between just laws, which are moral, and unjust laws, which are immoral, and urges people to disobey unjust laws (lines 69–73). Because both authors advocate for the breaking of laws that are not just, they would most likely agree that those who obey statutes may not be just, (C). Thoreau makes the claim that the “wooden men” who don’t follow their conscience are not exercising moral judgment, but King doesn’t echo those ideas, so (A) and (B) are wrong. Neither author claims that those who follow the law are more concerned with personal morality than public good, so (D) is also wrong.
37. **(B) Reading/Social Studies/Explicit Detail.** As similar as Thoreau and King’s standpoints are, there are also some differences. This question asks for an identification of one of those differences. In the first paragraph of Passage 1, Thoreau states that the thing that makes men human is their conscience—their ability to judge what is morally right and wrong. King, on the other hand, places his emphasis on morality, stating that as long as laws are morally upright, they should be followed (lines 51–52). If there are laws that are “morally upright,” there is a moral code that everyone follows, so the best answer choice is (B): Thoreau believes in moral judgment; King believes in a moral code. While Thoreau states that the “mass of men” (line 14) serve the state and do not exercise moral judgment, King does not state that most people adhere to moral laws, so (A) is wrong. (C) is wrong because Thoreau argues that laws are—or at least should be—moral, not the other way around. As for (D), Thoreau does not state that moral laws should be disobeyed.
38. **(C) Reading/Social Studies/Application.** King clearly states that he believes morally unjust laws should be broken, and furthermore, that the person who breaks those laws should accept punishment to “arouse the conscience of the community in its injustice” (lines 82–83), (C). All other answer choices state that King believes even morally unjust laws should be followed, but the passage explicitly states otherwise.
39. **(C) Reading/Natural Sciences/Main Idea.** The passage begins by explaining a problem: The western corn rootworm has become resistant to farmers’ techniques of rotating crops every other year. Then, the passage delves into studies researchers performed to find the root of that problem, so the best answer is (C). Researchers had to engage in several in-depth studies to find and address the problem, but this is not described as easy, so (A) is wrong. The latter part of the passage is centered on explaining, not summarizing, the studies, so (B) is wrong. Additionally, (B) doesn’t capture the idea of the first part of the passage—the introduction of the problem. As for (D), it is wrong because the passage doesn’t start as a description of a field, and it doesn’t move into details on how research is done.
40. **(C) Reading/Natural Sciences/Development.** The phrase “zoology is ecology” is used to show the way the study of animals is greatly impacted through the study of the way organisms interact with each other. The phrase implies that the zoology—or the study of animals—is really, or also, ecology—the study of relationships between organisms, as indicated by the example of the relationship between the western corn rootworm and its gut bacteria: a general point or idea supported by an example, (C). The connection between the two fields doesn’t mean that they should be merged into one, so (A) is wrong. It also doesn’t mean that studying one makes anyone an expert in the other, so (B) is wrong. And, the relationship between the fields doesn’t mean that one “supplants” the other, so (D) is wrong.
41. **(B) Reading/Natural Sciences/Implied Idea.** Lines 10–11 state that the rootworm in general, or normal rootworms, lay their eggs in corn fields so that their “larvae hatch into a feast of corn roots.” Rotation-resistant rootworms also lay their eggs in soybean fields so that “their larvae hatch in a crop of corn”



(lines 21–22), (B). There is no evidence in the passage to suggest that either rootworm reduces crop productivity, so (A) is wrong. (C) is wrong because normal rootworms die with crop rotation; it is only the rotation-resistant rootworms that can withstand the rotation. Finally, normal rootworms have very different gut bacteria from rotation-resistant rootworms (lines 39–40), so (D) is also wrong.

42. **(B) Reading/Natural Sciences/Explicit Detail.** The third paragraph introduces the ways some rootworms—crop-resistant rootworms—have been able to combat farmers’ rotation strategy: They “reduce their strong instincts” to lay eggs in corn and instead lay them in soybeans (lines 18–20), (B). Lines 15–17 explain that normal rootworms die, so (A) is wrong. Lines 25–28 simply state that scientists have been researching the issue, but can’t find the genes, so (C) is wrong. Lines 41–43 detail the findings of gut bacteria, not how some rootworms have overcome farmers’ efforts to eradicate them, so (D) is also wrong.
43. **(A) Reading/Natural Science/Main Idea.** The normal rootworm does not baffle farmers or researchers as they can rotate crops and take care of that problem. The rotation-resistant rootworm, though, poses a problem that has not been solved. The fourth paragraph introduces studies that have found that the rootworm is an “enigma” (line 29), and, despite extensive research, results have been “mostly inconclusive” (line 35), (A). While the rootworm’s ability to adapt to pest control methods is unique, that is the point of the third paragraph, not the fourth paragraph, so (B) is wrong. Researchers do find that the rootworms have complex genetic profiling, but that is not a point made in the fourth paragraph, so (C) is wrong. Finally, the fourth paragraph doesn’t state or imply that an inadequate understanding of genetics is to blame for inconclusive results, so (D) is also wrong.
44. **(A) Reading/Natural Sciences/Vocabulary.** “Separate” is usually used to mean “set apart.” In this context, “separate” is used to “tell apart” or “distinguish” between the normal rootworm and the rotation-resistant rootworm, (A). “Discharge” means “to unload”; “extract” means to “take out”; and “scatter” means “to separate wildly”—none of these words would make sense in the context of “separating” or “distinguishing” between the normal rootworm and the rotation-resistant rootworm.
45. **(A) Reading/Natural Sciences/Explicit Detail.** Lines 61–64 state that rotation-resistant rootworms have enzymes in their gut bacteria that enable them to avoid indigestion, which makes it easier for them to survive and lay their eggs in soybeans, (A). Lines 60–61 state that the gut bacteria of rotation-resistant rootworms have a higher, not lower, amount of cysteine protease, so (B) is wrong. The last paragraph says antibiotics are used to kill the bacteria, not the rootworms, so (C) is wrong. As for (D), there is no evidence in the passage to support the idea that the bacteria is transferred to larvae.
46. **(D) Reading/Natural Sciences/Evidence.** This question asks for the best evidence to support the correct answer to the previous question. Lines 29–30 state that the rootworms have been puzzling, but say nothing about their gut bacteria, so (A) can be eliminated. Lines 39–40 state that the rotation-resistant rootworms have very different gut bacteria than normal rootworms, but don’t provide any information about the gut bacteria surviving in soybean crops, so (B) is wrong. Lines 44–47 quote a researcher who simply states that the rootworm has been part of a “conspiracy” with other species, so (C) is also wrong. Only lines 54–55 provide evidence that rotation-resistant rootworms’ gut bacteria give them an “edge” in soybean crops.
47. **(C) Reading/Natural Sciences/Main Idea.** The last paragraph details the proof or evidence researchers found to show that bacteria are the culprit to rotation-resistant rootworms’ ability to digest soybeans, (C). The passage states that high amounts of cysteine protease enable rootworms to digest soybeans, not the other way around, so (A) is wrong. Additionally, this information is found in the second-to-last paragraph, not the last paragraph. (B) is wrong because the last paragraph focuses on the bacteria that can kill the cysteine protease that will not enable them to lay eggs in soybean crops, and (D) is wrong because the last two paragraphs clearly state that the rotation-resistant rootworms’ high amounts of cysteine protease—that have not been treated with antibiotics—are able to digest soybeans.

## WRITING AND LANGUAGE TEST EXPLANATIONS

1. **(D) Writing and Language/Standard English Conventions/Grammar and Usage/Pronoun Usage.** This question tests proper pronoun modification. The original has a dangling modifier error: Ever since who or what introduced coffee? Both (B) and (C) answer that question, but the addition of the pronoun “they” doesn’t properly modify the pronoun “it” later in the sentence, which refers to coffee, not a person. The best way to correct these problems is to remove the personal pronouns, so that “it” properly modifies “coffee,” (D).
2. **(B) Writing and Language/Expression of Ideas/Strategy/Effective Transitional Sentence.** The original transitional phrase “However” signals a contrast from the previous idea, but that is not the correct relationship between the sentences; sentence two provides evidence or explanation for the fact given in the previous sentence. The transitional phrases “Even so” (C) and “Despite its history” (D) also signal contrasting ideas; only “In fact,” (B), correctly links the ideas in the two sentences.
3. **(C) Writing and Language/Standard English Conventions/Grammar and Usage/Subject-Verb Agreement.** The original usage in this question has a subject-verb agreement and a pronoun agreement error: The singular “it has” doesn’t match the plural “coffeehouses” it modifies. To correct the error, both the pronoun and the verb need to be changed to their plural form, “they have,” (C). (B) doesn’t correct the agreement error in pronoun usage and creates an incorrect shift in verb tense, and while (D) fixes the pronoun agreement error, it also creates an incorrect shift in verb tense.
4. **(C) Writing and Language/Standard English Conventions/Grammar and Usage/Pronoun Usage.** The phrase in question modifies the people who go to coffeehouses, and “which” is not the proper pronoun to refer to people. All the other answer choices correct this problem, but only (C) has both pronoun and verb agreement and doesn’t introduce any other errors. (B) uses the correct pronoun, but the singular verb “loves” doesn’t match the plural pronoun “those,” and (D) uses the objective “whom” when the subjective “who” is needed.
5. **(B) Writing and Language/Standard English Conventions/Grammar and Usage/Subject-Verb Agreement.** This question can be a bit tricky as there is a fairly long phrase between the subject and the verb, which can make it more difficult to ascertain what the subject of the clause actually is. The subject is “the way,” which is a singular subject, but “contribute” is a plural verb. “Contributes,” (B) correctly makes the verb agree with the subject. (C) doesn’t correct the subject-verb agreement error and creates an additional error with a change in verb tense. (D) makes the needed change to a plural verb but introduces an unnecessary pronoun that makes the meaning of the clause difficult to understand.
6. **(B) Writing and Language/Expression of Ideas/Organization/Sentence-Level Structure.** This question asks for the identification of the appropriate information to connect the ideas in this sentence. The idea that sometimes sitting is worth an extra cost is connected to the premium for table service, but resting doesn’t explain the “premium cost,” so (A) is wrong. Tourists and being waited on are ideas that also don’t explain the “premium cost,” so (C) and (D) can be eliminated as well. Only (B) provides information that provides an explanation of a premium cost: Sitting at a table can be three to four times more expensive than the coffee itself.
7. **(A) Writing and Language/Expression of Ideas/Style/Conciseness.** The sentences at hand each have the same subject, “regular patrons,” so for purposes of concision, the sentences should be combined in a way that doesn’t repeat the subject or create unnecessary wordiness, (A). In (B), there are two dependent clauses that are needlessly wordy and can be combined into one clause, so it is wrong. The use of the semi-colon in (C) creates repetition of the subject, and cohesion is difficult in (D), so they are also wrong.
8. **(B) Writing and Language/Expression of Ideas/Strategy/Effective Opening Sentence.** This question asks for the best sentence to open the paragraph, which provides information about how Italians make



coffee. (A) is focused on the idea that espresso can be made at home, but the paragraph describes the correct way to make espresso overall, so (A) can be eliminated. (C) is wrong because it is a direct contradiction to the information presented in the paragraph supporting that there is only one way to make coffee, so it is also wrong. There is a contradiction in (D) as well: The passage emphasizes the idea that Italians are enthusiastic about coffee, so (D) is also wrong. Additionally, (D) is still focused on the role of coffee in Italy, and this paragraph is focused on the making of coffee. Only (B) moves from the cultural ideas about coffee to the making of it.

9. (A) **Writing and Language/Expression of Ideas/No Change.** “Proper,” “correct,” and “appropriate”—these words all mean roughly the same thing, so using both to describe how to make coffee would result in repetition of ideas, which means (B), (C), and (D) are all redundant answers. Only (A) uses one of these words to describe how to make coffee.
10. (D) **Writing and Language/Standard English Conventions/Punctuation/Commas.** “For example,” as it is used here, is a transitional phrase to move from one example to the next. These types of phrases must be set off by matching punctuation of either commas, parenthesis, or em dashes. Only (D) uses the same punctuation before and after the phrase to correctly separate the clause.
11. (D) **Writing and Language/Expression of Ideas/Strategy/Appropriate Supporting Material.** The sentence the author wants to add is focused on espresso popularity in the United States, but this paragraph, and the passage as a whole, is centered on coffee culture in Italy. Bringing in details about another country would take away from the main point of both the paragraph and the passage so (A) and (B) are wrong. (C) is also wrong because bringing in information about another country doesn’t take away from what has already been presented about coffee’s importance in Italy. Only (D) addresses why this sentence should not be added: It’s not related to the main point.
12. (B) **Writing and Language/Standard English Conventions/Sentence Structure/Fragments.** The phrase “A journey of thousands of kilometers that requires frequent stops to fuel up” is a dependent clause that must be joined with an independent clause in order to be a complete sentence. (A) uses a period to separate the clauses, and (C) and (D) use a semi-colon—all of which result in a fragment. Only (B) correctly joins the dependent clause to the independent clause with a comma.
13. (C) **Writing and Language/Standard English Conventions/Sentence Structure/Incomplete Split Constructions.** There are two clauses in the sentence at hand, and both are independent clauses, which means they must be joined by either a semi-colon or a comma and a conjunction. In (B), the conjunction is missing, so it is wrong. And in (A) and (D), a verb is missing, since “failing” is a participle. Only (C) joins the independent clauses with a comma and a conjunction and creates a grammatically correct sentence.
14. (C) **Writing and Language/Standard English Conventions/Punctuation/Commas.** The phrase “regardless of latitude” is not essential to the sentence, and therefore is a non-restrictive phrase that must be set off in matching punctuation—either commas, parenthesis, or em dashes. (A) is missing the necessary punctuation entirely, (B) doesn’t set the entire phrase off in commas, only the beginning of the phrase, and (D) uses a colon and a comma to separate the phrase, which results in a grammatically incorrect sentence. (C) is the only answer choice that uses matching commas to separate the non-restrictive phrase.
15. (D) **Writing and Language/Expression of Ideas/Style/Conciseness.** The error in the original usage is repetition: “Continuing on” at the beginning of the sentence and “continue on” at the end say the same thing, so (A) is wrong. “Continuing on” and “if they keep going” is also repetitive, so (B) is wrong. “Mortality” and “death” mean the same thing and using both is redundant, so (C) can also be eliminated. Only (D) avoids any redundancy.
16. (B) **Writing and Language/Standard English Conventions/Grammar and Usage/Subject-Verb Agreement.** The subject of the sentence at hand is “study,” a singular noun, which means the verb must also be



singular. “Provide” is a plural verb, so (A) is wrong, and “are providing” and “have provided” are different tenses of the verb, which result in a grammatically incorrect sentence, so (C) and (D) are also wrong. “Provides” is a singular verb that matches the singular subject and stays in the present tense, (B).

17. (B) *Writing and Language/Standard English Conventions/Punctuation/Apostrophes*. The object in this sentence, “eggs,” modifies what each nest has been baited with and is a plural, common noun. Plural, common nouns need no other punctuation, so (B) is the correct answer. “Eggs” is not possessive, so (A) and (C) are wrong, and “quails” and “eggs” both should not be plural, so (D) is also wrong.
18. (A) *Writing and Language/Expression of Ideas/Organization/Paragraph-Level Structure*. Sentence 5 describes what the scientists did with the nests described in sentence 4, and introduces the time-frame of the study—a time-frame that is also referenced in sentence 4, so sentence 5 is correct where it is currently placed, (A). Because sentence 5 describes one of the last steps the scientist took, placing sentence 5 after sentence 1 or 2 would logically disrupt the steps of the study and obscure meaning, so (B) and (C) are wrong. And, if sentence 5 was placed at the end of the paragraph, the reader would not know what “the nine days” in sentence 6 refer to, so (D) is also wrong.
19. (B) *Writing and Language/Expression of Ideas/Organization/Sentence-Level Structure*. The phrase at hand describes the parameters of the graph. Using a transitional word or phrase like “furthermore,” (A); “however,” (C); or “in addition,” (D) between the introduction of the graph and its description breaks up the logical meaning of the sentence. No transitional word or phrase is needed, (B).
20. (C) *Writing and Language/Expression of Ideas/Strategy/Data Presentation*. The data in the graph shows that the percentage of surviving nests decreased over time, (C). The graph shows the number of surviving nests at each site over time, but provides no information about predators affecting the survival of these nests, so (A) and (B) are wrong. Also, the graph clearly shows that the surviving nests decreased, not increased, over time, so (D) is also wrong.
21. (A) *Writing and Language/Expression of Ideas/Strategy/Data Presentation*. The graph shows the percentage of surviving nests at four locations, all at different latitudes. The highest latitudes, 82 degrees north and 73 degrees north, had surviving nest percentages around 55 and 21, respectively. The locations with lower latitudes had surviving nest percentages around 5 and zero, so the higher latitudes had more surviving nests, (A). (B) is wrong because the graph shows the percentage was greater, not smaller, (C) is wrong because the percentage of surviving nests fluctuates, not stays the same, and (D) is wrong because the number or percentage of eggs is not information the graph provides.
22. (A) *Writing and Language/Expression of Ideas/No Change*. These sentences must be combined in a way that retains their contrasting ideas: risks and rewards. The shorebirds risk their lives by flying farther, but their offspring have better odds of survival. The transitional word “although” correctly shows this relationship and is a grammatically correct sentence, (A). (B), (C), and (D) are wrong because “in addition” and “and” signal ideas that build off one another, not contrast each other. Additionally, they are needlessly wordy.
23. (C) *Writing and Language/Expression of Ideas/Style/Clarity of Meaning*. Louis Armstrong didn’t stick to, or “adhere” to the musical score as it was written, (C). “Bond” means to “tie to,” and a person can’t “tie” to a musical score, so (A) is wrong. “Emulate” means to “imitate” and Armstrong wasn’t mimicking the score, so (B) is wrong, and “cohere” means “to hold together” which also doesn’t reflect the musical score’s relationship to Armstrong, so (D) is wrong.
24. (D) *Writing and Language/Standard English Conventions/Sentence Structure/Fragments*. The sentences in question need to be combined as the first clause is a dependent clause and, structured as its own sentence as it is in (A), it is a fragment. (C) is guilty of the same error: The semi-colon incorrectly joins a dependent clause and an independent clause. As for (B), the comma necessary to join a dependent



clause with an independent clause is missing, so it is also wrong. Only (D) correctly joins the clauses with a comma.

25. (C) *Writing and Language/Standard English Conventions/Sentence Structure/Faulty Parallelism*. The phrases “not only” and “but only” in this sentence must be followed by phrases that are in the same grammatical structure—parallel form. Because “but also” is followed with “by,” “not only” must also be followed with “by,” (C). All other answer choices do not retain the necessary structure between the parallel elements of the sentence.
26. (A) *Writing and Language/Expression of Ideas/Strategy/Appropriate Supporting Material*. The sentence the author wants to add both expands on the idea in the previous sentence and introduces the quote in the next sentence, (A). The sentence adds an example of Armstrong’s skill at improvisation but not an explanation, so (B) is wrong, and (C) and (D) are wrong because the sentence neither presents a previously presented idea nor makes the focus of the paragraph unclear.
27. (A) *Writing and Language/Expression of Ideas/No Change*. This question asks for the best sentence to introduce the ideas in the current paragraph—which focus on the evolution of the band—and connect to the ideas in the previous paragraph, which were about the band’s solos. (B) is wrong because it focuses on a small detail from the previous paragraph, not connects to its main point. (C) is wrong because Redman isn’t introduced until later in the current paragraph, and (D) is wrong because the idea that the band had a conservative reputation is information the passage does not provide. Only (A) effectively connects the ideas between the previous paragraphs and the current paragraph.
28. (B) *Writing and Language/Expression of Ideas/Strategy/Appropriate Supporting Material*. The information the author wants to add to the sentence provides a definition of a term readers may not be familiar with to aid in understanding, (B). The revision the author wants to make doesn’t specifically address an instrument Armstrong played, so (A) is wrong. (C) is wrong because the information adds clarity to an ambiguous term and therefore is not irrelevant, and (D) is wrong because the information aids in more thorough understanding of the point, not diverges from it.
29. (D) *Writing and Language/Expression of Ideas/Style/Conciseness*. “Adjusted,” “altered,” “changed,” and “reworking” all have roughly the same meaning, so using two or more of any of these words results in unnecessary redundancy. Only (D) avoids needless repetition of ideas and uses only one of these words.
30. (C) *Writing and Language/Standard English Conventions/Punctuation/Commas*. When “that” precedes a quotation, no punctuation is needed. (A), (B), and (D) all include unnecessary punctuation before the quoted material. Only (C) eliminates the needless punctuation.



A comma is only needed before a quotation if the quoted material is a complete sentence. For example, Scott recalled, “My goodness, people stopped dancing....” The quoted text is a complete sentence so the text that introduces it must be preceded by a comma. When a quote is preceded by “that” or a clause that isn’t a complete sentence, no punctuation before the quote is necessary.

31. (D) *Writing and Language/Expression of Ideas/Style/Clarity of Meaning*. This sentence needs a transitional word that correctly demonstrates the relationship between the contrasting ideas in this sentence: Armstrong left, but his influence remained, (D). “For instance,” introduces an example, not a contrast, so (A) can be eliminated. “Therefore” introduces a conclusion, and “likewise” connects similar ideas, so both (B) and (C) are wrong as well.
32. (B) *Writing and Language/Standard English Conventions/Grammar and Usage/Diction*. When a situation changes or moves into another, it “gives way,” (B). Given “away,” is not an idiomatic expression, so (A) is wrong. Given “into” and given “away for” do not retain the necessary relationship between a change or move and are not idiomatic, so both (C) and (D) are also wrong.

33. (D) *Writing and Language/Standard English Conventions/Punctuation/Commas*. The clause “that would become hallmarks...” is necessary to the meaning of the sentence and so should not be set off by any punctuation. The only answer choice that doesn’t incorrectly use a comma to set off the necessary clause is (D).
34. (D) *Writing and Language/Expression of Ideas/Organization/Paragraph-Level Structure*. Sentence 3 uses the demonstrative pronoun “these” to refer to “tales,” but where the sentence is currently placed, the reader doesn’t know what “these tales” refers to. Sentence 6 is about “stories”—a synonym for “tales”—of young artists making it in the city, so it makes the most sense to move sentence 3 after sentence 6 to know what “stories” or “tales” the author is referring to, (D). Placing sentence 3 anywhere else in the paragraph is illogical because “these tales” need to refer to something previously mentioned.
35. (D) *Writing and Language/Standard English Conventions/Grammar and Usage/Pronoun Usage*. At first glance, “artist” looks correct, because artists were the main subject of the previous paragraph. In this sentence, however, the pronoun “your” is used, so to be consistent with this point-of-view, the second-person pronoun “you” must also be used, (D). “An artist,” (A); “artists,” (B); and “one,” (C) are not consistent in person with “you.”
36. (B) *Writing and Language/Expression of Ideas/Strategy/Effective Transitional Sentence*. This question asks for the best transitional word to demonstrate the relationship between the idea in the previous sentence—artists could make a living and practice their art—and the idea in the current sentence—this lifestyle is no longer possible. These ideas contrast each other, so a transitional word that shows the difference between past and present is needed. “Therefore” signals a conclusion, not a contrast, so (A) can be eliminated. “Consequently” signals a result, not a contrast, so (C) is also wrong. As for (D), “for instance” introduces an example, which is not the appropriate relationship for these sentences. Only (B) correctly uses a word to show the contrasting relationship between the past and the present.
37. (C) *Writing and Language/Expression of Ideas/Style/Clarity of Meaning*. The problem with the original usage is that the reader doesn’t know what “other” places refers to; a descriptive phrase that doesn’t use ambiguous pronouns and articulates the contrast between what is replacing the “affordable” places is needed to introduce the list that follows. (B) corrects the ambiguity, but misconstrues the contrast: Artists are not spending at some places and not at others; they are losing places where they can practice art. (D) also corrects the ambiguity in the original usage but doesn’t portray the correct contrast, as “attractive” new places are not what is preventing artists from being able to practice their craft. Only (C) is specific and demonstrates the contrast between the “affordable” venues that showcased authors’ work and the upscale places that are replacing these venues. It is also the only answer choice that describes the list that follows: “Expensive,” “couture,” and “exclusive” describe luxury or “upscale” places.
38. (A) *Writing and Language/Standard English Conventions/No Change*. The phrase “go so far as” means “go to the extent or degree of” and is an idiomatic expression, (A). “Too far” is not idiomatic in this context because business leaders are not going beyond a degree, they are going to the extent of it, so (B) is wrong. “Farther” refers to distance, so (C) is wrong, and deleting the underlined portion results in the phrase, “go to declare,” which is not idiomatic and makes meaning unclear, so (D) is also wrong.
39. (C) *Writing and Language/Standard English Conventions/Punctuation/Dashes*. The phrase “a great place for young artists” describes Cleveland, Ohio, so punctuation is needed to introduce this description. A semi-colon cannot be used because “a great place for young artists” is not a complete sentence, so (A) can be eliminated. A colon after “is” both disrupts the description of Ohio and is grammatically incorrect as a colon cannot follow a verb, so (B) is wrong. And, if a parenthesis is used to introduce the phrase, a closed parenthesis must be used to end the phrase, but that end parenthesis is not provided, so (D) is also wrong. Only (C) uses an em dash to correctly introduce the description of Cleveland.



**TIP** A colon can never follow a verb, so any answer choice that structures a colon after a verb can immediately be eliminated. The hard-and-fast rule for colons is that they introduce a list, explanation, or idea; the clause that is used to introduce any of these things must be a complete sentence.

40. **(D) Writing and Language/Expression of Ideas/Style/Conciseness.** This question can be a bit tricky as “moving to Cleveland” is the grammatically correct usage as it retains parallel structure with “willing.” However, the sentence is about Cleveland’s efforts to get more artists to move there, so saying “to Cleveland” is not necessary, (A). Both (B) and (C) are needlessly wordy and grammatically incorrect as “move” doesn’t match “willing.” Only (D) retains parallel structure and removes the needless renaming of Cleveland.

**TIP** When the original usage is grammatically correct, don’t be in a hurry to move on to the next question, as there may be something else wrong—like needless repetition. Quickly plug in the all answer choices to see if you spot another type of error not related to grammar or punctuation. Remember, the Writing and Language test also asks Expression of Ideas items that are not wholly concerned with standard English conventions.

41. **(D) Writing and Language/Standard English Conventions/Grammar and Usage/Problems of Subordination and Coordination.** The correct answer is (D), because the plural pronoun “those” correctly refers to the plural “prices” to show that two things are being compared: prices of homes to prices of economy cars. (A) is wrong because it doesn’t provide the right comparison: prices of homes are compared to economy cars, not the prices of the cars. (B) is wrong because “that” is a singular pronoun that doesn’t correspond to the plural “prices,” and (C) is wrong because “car’s” is a singular possessive noun that doesn’t correspond to the plural and non-possessive “prices.”
42. **(A) Writing and Language/Standard English Conventions/No Change.** The pronoun in question is referring to Cleveland, a singular city, so the pronoun must also be singular. “They’re” and “their” are plural pronouns, so both (B) and (D) are incorrect. Additionally, “they’re” is not possessive; it is a contraction for “they are.” (C) is correctly uses a singular pronoun but “it’s” is a contraction for “it is,” not a possessive pronoun. Only (A) correctly uses the singular possessive pronoun “its.”
43. **(C) Writing and Language/Expression of Ideas/Strategy/Appropriate Supporting Material.** The sentence the author wants to add is about artists being able to get around cities with bicycles, but the paragraph is about places that may be ideal for artists to live. This detail is not closely related to the main point of this paragraph, (C). Adding the sentence would provide an unnecessary detail that doesn’t have a clear place in the context, so (A) and (B) are wrong, and (D) is wrong because the ability to get around on bicycles is not an important detail for artists to live well.
44. **(B) Writing and Language/Expression of Ideas/Style/Precision.** This sentence is imploring artists to not “write off” smaller cities like Cleveland. “Undermine” means to weaken, not disregard or write off, so (A) can be eliminated. “Blow off” and “give the cold shoulder to” get close to this meaning, but they are too informal and colloquial to match the tone of the rest of the passage. The best answer choice is (B): “Discount” in this context means to “disregard.”

# MATH TEST EXPLANATIONS

## Section 3: Math Test—No Calculator

1. (D) **Math: Multiple-Choice/Algebra/Manipulating Algebraic Expressions/Factoring Expressions.** The item stem asks which of the expressions given in the answer choices is equivalent to  $15x + 24ax$ . Since the answer depends on the choices, quickly check the choices for matching coefficients on the  $x$  and the  $ax$  terms. Only (D) matches: the  $x$  has been factored out of the given expression:  $(15 + 24a)x = 15x + 24ax$ .

**TIP** This item depends on the answer choices for the correct expression. The given expression  $15x + 24ax$  could be rewritten a number of ways. Don't waste time creating expressions that may or may not be given in the choices. Skip straight to the choices and compare each with the given equation.

2. (A) **Math: Multiple-Choice/Algebra/Manipulating Algebraic Expressions/Basic Algebraic Manipulations.** The item stem presents a formula in a real world context, making it seem more complicated than it is. Just focus on the question at the end of the stem: what is  $r$  in terms of  $d$  and  $t$ ? Solve the given equation

$$d = rt \text{ for } r \text{ by dividing both sides by } t: d = rt \Rightarrow \frac{d}{t} = \frac{rt}{t} \Rightarrow r = \frac{d}{t}, (A).$$

3. (B) **Math: Multiple-Choice/Algebra/Solving Simultaneous Equations.** At first glance, this item seems to be asking you to solve the system of equations consisting of one quadratic and one linear equation in two variables. However, the answer is given to you in one of the answer choices. You don't actually have to solve the system—you just need to test the answer choices. Use the “test-the-test” strategy. Substitute the values for  $x$  and  $y$  given in each of the  $(x, y)$  coordinate pairs into the quadratic and linear equations—only the correct coordinate pair will make both equations true.

**TIP** The correct solution to the system of equations must be one of the given coordinate pairs. Don't waste time solving the system—test-the-test instead!

$$A) \quad (0, -4): y = x^2 + 3x - 4 \Rightarrow -4 \stackrel{?}{=} 0^2 + 3(0) - 4 = -4 \checkmark$$

$$x = y - 4 \Rightarrow 0 \stackrel{?}{=} -4 - 4 \Rightarrow 0 \neq -8 \times$$

$$B) \quad (2, 6): y = x^2 + 3x - 4 \Rightarrow 6 \stackrel{?}{=} 2^2 + 3(2) - 4 = 4 + 6 - 4 \Rightarrow 6 = 6 \checkmark$$

$$x = y - 4 \Rightarrow 2 \stackrel{?}{=} 6 - 4 = 2 \checkmark$$

Both equations hold true for (B), so (B) must be correct.

**TIP** Once you've found which coordinate pair works in both equations, don't bother testing the remaining choices. Make your selection and move on!

4. (C) **Math: Multiple-Choice/Algebra/Solving Quadratic Equations and Relations/Factoring.** This item asks you to solve a quadratic equation. You have two choices: solve the quadratic or apply the “test-the-test” strategy. If you are comfortable factoring quadratic equations, this method may be fastest, depending on how many choices you'd have to test. Rewrite the equation in standard quadratic form:

$$2x^2 + 4x = 3 + 3x^2 \Rightarrow 3 + 3x^2 - 2x^2 - 4x = 0 \Rightarrow x^2 - 4x + 3 = 0. \text{ Reverse-FOIL the left-side of the equation:}$$



$x^2 - 4x + 3 = (x - 3)(x - 1) = 0$ . Therefore, the equation is true for  $x = 3$  and  $x = 1$ . Only 3 is given in the choices, (C).

If you aren't comfortable factoring quadratics, it may be faster to test the choices. You can use the equation as given, or the rewritten standard quadratic form,  $x^2 - 4x + 3 = 0$ . Only the correct value will make the equation true:

A)  $-1: (-1)^2 - 4(-1) + 3 = 1 + 4 + 3 \neq 0$  ✗

B)  $0: (0)^2 - 4(0) + 3 = 3 \neq 0$  ✗

C)  $3: (3)^2 - 4(3) + 3 = 9 - 12 + 3 = 0$  ✓

5. (C) **Math: Multiple-Choice/Algebra/Solving Simultaneous Equations.** The item stem asks only for the  $x$ -coordinate of the solution, so the quickest solution is to use the elimination method: combine the equations in a way that eliminates the  $y$ -variable. The lowest common multiple of the coefficients on the  $y$ -terms is 20, so multiply the first equation by 5 and the second equation by  $-2$  before combining them:

$$\begin{array}{r} 5(-3x - 4y = 20) \\ -2(x - 10y = 16) \\ \hline -15x - 20y = 100 \\ -2x + 20y = -32 \\ \hline -17x = 68 \Rightarrow x = -4 \end{array}$$

You can also solve this item by using the substitution method, but this takes longer as it requires first solving for  $y$  and then substituting this value back into either equation to determine  $x$ .

6. (B) **Math: Multiple-Choice/Coordinate Geometry/Slope-Intercept Form of a Linear Equation and Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions.** This item presents a linear equation that models a real world context and asks you to interpret what the  $y$ -intercept indicates in terms of that context. For a linear equation in the slope-intercept form  $y = mx + b$ ,  $b$  is the  $y$ -intercept, or the value of  $y$  when  $x = 0$  ( $m$  is the slope of the line). For story problems like this, rewrite the given equation with the units, both stated and implied, so that all terms in the equation have the same units. In this case,  $y$  is the tree height in inches and  $x$  is the number of years after planting, so

$y(\text{inches}) = 36 \text{ inches} + 18 \frac{\text{inches}}{\text{year}}(x \text{ years})$ . The  $y$ -intercept is the constant term "36 inches," which

corresponds to the height of the tree when  $x = 0$ , or when the tree is planted, (B).

**TIP** Watch out for attractive distractors! (D) is an attractive distractor because it also gives a measurement of inches, like the correct answer. However, the number of inches the tree grows per year is the slope of the equation,  $m$ , which in this case is 18 inches per year.

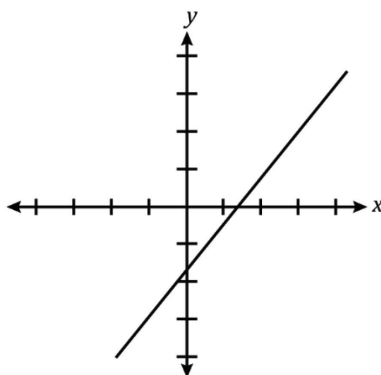
7. (A) **Math: Multiple-Choice/Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Creating Algebraic Equations.** Translate the given scenario into an equation that includes units, so that each term has units of dollars. The total cost of the purchase is equal to the cost of the items plus 8% sales tax, which is 1.08 times the cost of the shirts plus the cost of the sweaters. The cost of the shirts is the product of the number of shirts (2) and the cost per shirt (\$19.40); the cost of the sweaters is the product of the number of sweaters ( $p$ ) and the cost per sweater (\$24.80). Therefore, the

total cost in dollars is  $y(\text{dollars}) = 1.08 \left[ 2 \text{ shirts} \left( \frac{\$19.40}{\text{shirt}} \right) + p \text{ sweaters} \left( \frac{\$24.80}{\text{sweater}} \right) \right] \Rightarrow$

$y = 1.08(38.80 + 24.80p)$ , (A).

**TIP** Anytime you have to create, evaluate, or interpret an equation in a real world context, rewrite the given equation with units, both stated and implied, so that all terms in the equation have the same units.

8. **(B) Math: Multiple-Choice/Coordinate Geometry/The Coordinate System and Graphs of Linear Equations.** The item stem asks for the answer choice that CANNOT lie on the described line, so eliminate the choices that can lie on the line. Draw a sketch of the given information: a line with a negative  $y$ -intercept (the  $y$ -value for  $x = 0$ ) and positive slope:



Based on the sketch, it's clear that the line cannot go through Quadrant II, where the  $x$ -values are negative and the  $y$ -values are positive. The only choice with a coordinate pair  $(x, y)$  that is  $(-, +)$  is (B).

**TIP** If an item doesn't include a figure, but one would be useful for visualizing the scenario, draw one. It doesn't have to be perfect, but it should include all relevant parts described in the item stem. In this case, the relevant pieces of information are that the  $y$ -intercept is below the  $x$ -axis (negative) and the slope is positive (increases from left to right).

9. **(C) Math: Multiple-Choice/Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Concepts of Domain and Range.** The total length of rope  $x$ , in centimeters, is equal to the sum of the lengths of the 18 pieces of rope, each of which is at least 270 centimeters but no more than 280 centimeters long. Therefore, each piece of rope can vary by as much as 10 centimeters, and since there are 18 pieces of rope, the total length of the rope can vary by as much as  $18(10) = 180$  centimeters. (A), (B), and (D) all vary by no more than 10 centimeters. Therefore, the correct answer must be (C). Indeed, the variance in (C) is  $5,040 - 4,860 = 180$  centimeters.

**TIP** Once you know that the variance in the total length of rope is 180 centimeters, you can eliminate (A), (B), and (D). Don't bother determining the actual variance in (C)—you know it's more than the others, so that's enough. Make your selection and move on!

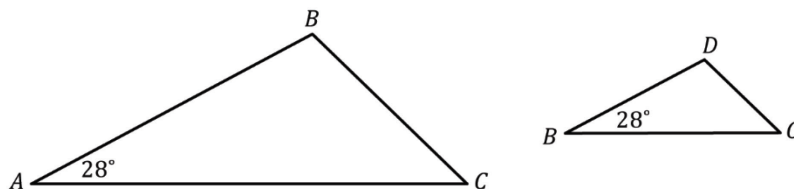
10. **(D) Math: Multiple-Choice/Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Functions as Models.** Before even reading the item stem, you know from the answer choices that the question is going to ask you to create a system of linear inequalities to describe the given scenario. According to the item stem, the total cost of the supplies must be no more than \$60, which eliminates (A) and (C) (the first inequality in each of these has the total cost as being at least \$60). To choose between (B) and (D), look to the remaining inequalities. The second inequality in (B) states that the total number of boxes of nails and boxes of screws is less than 1. A fraction of a box makes no sense, so the correct answer must be (D).

**TIP** Preview the answer choices. When answering math items, quickly check the answer choices before you read the item stem. You may not learn much from the choices if they only contain values.



However, if they contain algebraic equations or systems of equations, you'll know to translate the information given in the item stem into algebraic expressions and equations as you read through it.

11. (A) **Math: Multiple-Choice/Geometry/Triangles/Properties of Triangles.** The item stem asks about the ratios of sides of the triangles shown in the figure. Since the triangles don't have right angles, the question is about similar triangles. To determine which triangles are similar, identify two angles that are identical in both triangles. Triangles  $ABC$  and  $BCD$  both have a  $28^\circ$  angle and both share vertex  $C$ , so these triangles are similar, which means the ratio of any two similar sides is equal. Redraw the triangles with the  $28^\circ$  angle and the  $C$  vertex in similar positions:



The ratio of  $AB$  to  $BC$  in triangle  $ABC$  is the same as the ratio of  $BD$  to  $DC$  in triangle  $BCD$ , (A).

12. (C) **Math: Multiple-Choice/Algebra/Manipulating Algebraic Expressions/Manipulating Expressions Involving Exponents.** This item tests your ability to apply the rules of exponents to the left side of the given equation. First, apply the rule for raising a base raised to a power to another power,

$$(x^m)^n = x^{m(n)} : (x^2 y^3)^{\frac{1}{2}} (x^2 y^3)^{\frac{1}{3}} = x^{2(\frac{1}{2})} y^{3(\frac{1}{2})} x^{2(\frac{1}{3})} y^{3(\frac{1}{3})} = x y^{\frac{3}{2}} x^{\frac{2}{3}} y = x y^{\frac{3}{2}} x^{\frac{2}{3}} y$$

Now, apply the rule for multiplying similar bases raised to different powers,  $(x^m)(x^n) = x^{m+n} : x y^{\frac{3}{2}} x^{\frac{2}{3}} y = x^{1+\frac{2}{3}} y^{\frac{3}{2}+1} = x^{\frac{5}{3}} y^{\frac{5}{2}}$ . Therefore,

$$x^{\frac{5}{3}} y^{\frac{5}{2}} = x^{\frac{a}{3}} y^{\frac{a}{2}}, \text{ so } a = 5, \text{ (C).}$$



Know the rules for working with exponents:

$$(x^m)(x^n) = x^{m+n} \rightarrow x^0 = 1, \text{ if } x \neq 0$$

$$\frac{x^m}{x^n} = x^{m-n} \rightarrow x^{-n} = \frac{1}{x^n}$$

$$(x^m)^n = x^{m(n)} \rightarrow x^{\frac{1}{n}} = \sqrt[n]{x}, \text{ where } n \neq 0$$

$$\left(\frac{x^m}{y^m}\right)^n = \frac{x^{mn}}{y^{mn}} \rightarrow \frac{x^{\frac{m}{n}}}{y^{\frac{m}{n}}} = \sqrt[n]{\frac{x^m}{y^m}}, \text{ where } n \neq 0$$

13. (B) **Math: Multiple-Choice/Coordinate Geometry/Graphs of Quadratic Equations and Relations and Algebra/Solving Quadratic Equations and Relations/Roots of Quadratics.** Quadratic equations graphed in the  $xy$ -plane are parabolas. Parabolas have an axis symmetry that passes through the vertex of the parabola. The vertex of the parabola has an  $x$ -coordinate equal to the midpoint between the two  $x$ -intercepts. The quadratic equation  $y = (x - 6)(x + 12)$  has  $x$ -intercepts (the function crosses the  $x$ -axis

for  $y = 0$ ) at  $x = 6$  and  $x = -12$ . Therefore, the  $x$ -coordinate of the vertex is  $\frac{-12+6}{2} = -3$ , (B).

14. (2) **Math: Student-Produced Responses/Coordinate Geometry/Graphs of Linear Equations and Algebra/Solving Algebraic Equations or Inequalities with One Variable/Simple Equations.** A linear equation with an infinite number of solutions is true for any value of  $x$ . The given equation  $21x + 14 = 7(3x + a)$  can be rewritten as  $21x + 14 = 21x + 7a$ . For this equation to be true regardless of  $x$ ,  $14 = 7a \Rightarrow a = 2$ .

15. (90) **Math: Student-Produced Responses/Algebra/Solving Simultaneous Equations and Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Creating Algebraic Equations.** Translate the given scenario into a system of linear equations. If  $M$  represents the number of minutes Juliene practiced on Monday, and  $T$  represents the number of minutes she practiced on Tuesday, and the total time was 2 hours and 15 minutes, or 135 minutes, then  $M + T = 135$ . Since she practiced twice as long on Monday as Tuesday,  $M = 2T$ . The item stem asks for the number of minutes practiced on Monday, so replace  $T$  with  $\frac{M}{2}$  (from the second equation) in the first equation and solve for  $M$ :  $M + \frac{M}{2} = 135 \Rightarrow 3M = 270 \Rightarrow M = 90$ .

**TIP** Target your solutions. Don't waste time solving for what you don't need. The item stem only asks for the value of  $x$ . Regardless of the method used to solve the simultaneous equations (in this case, substitution), apply it in a way that gives the value for  $x$  directly, without having to also solve for  $y$ .

16. (1) **Math: Student-Produced Responses/Algebra/Solving Quadratic Equations and Relations/Factoring.** Rewrite the quadratic expression  $12x^2 + ax - 20$  as a product of two binomials, one of which is the given factor  $3x + 4$ :  $12x^2 + ax - 20 = (3x + 4)(mx + n)$ , where  $m$  and  $n$  are integers. Use the FOIL method to multiply the binomials on the right side of the equation:  $(3x + 4)(mx + n) = 3mx^2 + 3xn + 4mx + 4n = 3mx^2 + (3n + 4m)x + 4n$ . The coefficient in each of these terms must equal the corresponding coefficient in the original quadratic expression:  $12 = 3m$ ,  $a = 3n + 4m$ , and  $-20 = 4n$ . Therefore,  $m = 4$ ,  $n = -5$ , and  $a = 3(-5) + 4(4) = -15 + 16 = 1$ .
17. (0) **Math: Student-Produced Responses/Algebra/Manipulating Algebraic Expressions/Basic Algebraic Expressions.** This is the last item in this section, so you might expect it to be difficult. Don't worry—the item stem tells you where to start: “multiply out” the given expression and collect like terms. Use the FOIL method to multiply the binomials:  $(ax + by)(cx - dy) = acx^2 - adxy + bcxy - bdy^2$ . According to the stem,  $ad = bc$ , so the  $xy$  terms cancel:  $acx^2 - adxy + bcxy - bdy^2 = acx^2 - bdy^2$ . Therefore, regardless of  $ac$  and  $bd$ , the coefficient on the  $xy$  term is 0.

**TIP** Student-Produced Responses can seem more difficult because you don't have the “test-the-test” and “plug-and-chug” strategies to fall back on. However, you still have the item stem: read it carefully for guidance.

**TIP** Don't be distracted by extraneous information. The item stem gives the values of  $ac$  and  $bd$ , and you could plug these values into the simplified binomial product:  $acx^2 - bdy^2 = 18x^2 - 50y^2$ . However, this would be a waste of time. Once you know that the  $xy$  terms cancel, you know the coefficient must be 0. Fill in your answer and move on!

#### Section 4: Math Test—Calculator

1. (B) **Math: Multiple-Choice/Data Interpretation/Bar, Cumulative, and Line Graphs.** The item stem asks you to compare the change in the number of students during the periods given in each of the answer choices to identify the period with the greatest increase. Notice that you don't have to calculate the actual increase in the number of students during each period—it's enough to estimate. The periods



described in (A), (C), and (D) all have much smaller increases as compared with the period described in (B), Quarters 7 through 10 (which corresponds to the part of the graph with the greatest slope).

**TIP** Estimate! Before determining the actual values of students at the beginning and ends of each period given in the answer choices, do a quick comparison. You'll see that (A), (C), and (D) all have much smaller increases compared with (B). That's enough to answer the question and move on!

2. (A) **Math: Multiple-Choice/Coordinate Geometry/Slope-Intercept Form of a Linear Equation and Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions.** This item presents a linear equation that models a real world context and asks you to interpret what the  $y$ -intercept indicates in terms of that context. Rewrite the given linear equation with the units, both stated and implied, so that all terms in the equation have the same units. In this case,  $T$  is the total amount saved in dollars and  $m$  is the number of months since Eli started saving money, so

$$T(\text{dollars}) = 83 \text{ dollars} + 30 \frac{\text{dollars}}{\text{month}} (m \text{ months}).$$

The  $y$ -intercept is the "83 dollars" term, which

corresponds to the amount of money when  $m = 0$ , or when Eli started saving, (A).

3. (B) **Math: Multiple-Choice/Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Proportions and Direct-Inverse Variation.** The scenario is one of direct variation: the more bananas consumed, the more zinc provided. Create a direct proportion between the two ratios of bananas to zinc:
- $$\frac{100 \text{ g bananas}}{0.15 \text{ mg zinc}} = \frac{140 \text{ g bananas}}{x \text{ mg zinc}}.$$
- Solve the proportion for the unknown quantity of zinc:

$$x = \frac{140(0.15)}{100} = 0.21, \text{ in milligrams of zinc, (B).}$$

**TIP** Use your calculator. You shouldn't be doing any arithmetic by hand that is more easily done by calculator. This is the CALCULATOR section, so use your calculator if it will be faster and less-error prone than doing the calculations by hand.

4. (D) **Math: Multiple-Choice/Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Concepts of Domain and Range.** According to the item stem, the linear equation  $y = 5x + p$  passes through the point  $(-2, 1)$  when graphed in the  $xy$ -coordinate plane, so  $y = 1$  for  $x = -2$ . Substitute these values for  $x$  and  $y$  in the equation and solve for  $p$ :  $1 = 5(-2) + p \Rightarrow p = 1 + 10 = 11$ , (D).
5. (B) **Math: Multiple-Choice/Data Interpretation/Scatterplots and Coordinate Geometry/Slope of a Line.** The line of best fit for the data in the scatterplot has a positive linear slope, which indicates that the number of hits by players on the team increases as the number of times at bat increases, (B).
6. (A) **Math: Multiple-Choice/Data Interpretation/Scatterplots.** The actual number of hits by each player are represented by the dots in the scatterplot. The predicted number of hits are the  $y$ -values on the line corresponding to the same  $x$ -value (number of times at bat). According to the scatterplot, the player with 450 times at bat has approximately 112 (about halfway between 100 and 125) hits, while the  $y$ -value indicated by the line of best fit is approximately 122 (slightly less than 125), for a difference of 10 hits, (A).
7. (B) **Math: Multiple-Choice/Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Ratios.** Translate the given information into an expression of ratios and rates, in which like units cancel, leaving the final units of the expression in words per minute:

$$\frac{400 \text{ characters}}{\text{second}} \times \frac{1 \text{ word}}{5 \text{ characters}} \times \frac{60 \text{ seconds}}{\text{minute}} = 4,800 \text{ words per minute, (B).}$$



8. (C) **Math: Multiple-Choice/Algebra/Evaluating Sequences Involving Exponential Growth and Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Percentages.** Use your calculator to determine the difference in salary between consecutive years:

$$\text{Year 0} \rightarrow 1: 39,140 - 38,000 = 1,140$$

$$\text{Year 1} \rightarrow 2: 40,314 - 39,140 = 1,174$$

$$\text{Year 2} \rightarrow 3: 41,524 - 40,314 = 1,210$$

$$\text{Year 3} \rightarrow 4: 42,769 - 41,524 = 1,245$$

Since the amount of salary increase between consecutive years increases with each year, the model that fits the data is exponential. To determine the percent increase, use the change-over-original formula for

any of the increases shown above:  $\frac{1,174}{39,140} \times 100 \approx 3\%$ , (C).

9. (A) **Math: Multiple-Choice/Algebra/Manipulating Algebraic Expressions/Basic Algebraic Manipulations.** Distribute the negative through the second expression and combine similar terms:

$$(x^2y - 3y^2 + 5xy^2) - (-x^2y + 3xy^2 - 3y^2) = x^2y - 3y^2 + 5xy^2 + x^2y - 3xy^2 + 3y^2 =$$

$$(x^2y + x^2y) + (-3y^2 + 3y^2) + (5xy^2 - 3xy^2) = 2x^2y + 2xy^2, (A).$$

10. (D) **Math: Multiple-Choice/Algebra/Solving Algebraic Equations or Inequalities with One Variable/Simple Equations.** Simplify the given equation by moving all the terms to one side and combining like terms:

$$4x - \frac{1}{2}x - 7 = 7\left(\frac{1}{2}x - 7\right) \Rightarrow 4x - \frac{1}{2}x - 7 - \frac{7}{2}x + 49 = 0 \Rightarrow 4x - \frac{8}{2}x - 7 + 49 = 0 \Rightarrow 42 = 0, \text{ which is never true}$$

regardless of the value of  $x$ . Therefore, the equation has no solutions, (D).

11. (D) **Math: Multiple-Choice/Statistics/Measures of Center and Spread/Median and Range.** According to the data in the table, Joseph's electricity bills have a range of  $\$193.12 - \$145.30 = \$47.82$  and Samuel's bills have a range of  $\$188.99 - \$149.23 = \$39.76$ . Since the range of Joseph's bill is greater than Samuel's bills, eliminate (A) and (D). The median of Joseph's bills is  $\$180.33$  and the median of Samuel's bills is  $\$181.27$ , so Joseph's bills have a smaller median than do Samuel's bills. Therefore, the correct answer is (D).

12. (A) **Math: Multiple-Choice/Statistics/Common Data Representations/Frequency Tables and Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Percentages.** According to the table, the number of double-decker cars that have been in service less than 10 years is 16. The item stem states that the total number of train cars is 810, so the percentage of the train cars in service that are both double-decker and in service less than 10 years is  $\frac{16}{810}(100) \approx 2\%$ , (A).

13. (B) **Math: Multiple-Choice/Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Ratios.** Translate the given information into an expression of ratios in which like units cancel, leaving the expression with units that correspond to the number of groups of boxes:

$$\frac{1 \text{ group of boxes}}{900 \text{ inches}} \times \frac{12 \text{ inches}}{\text{foot}} \times 1,500 \text{ feet} = 20 \text{ groups of boxes, (B).}$$

14. (C) **Math: Multiple-Choice/Data Interpretation/Tables and Statistics/Measures of Center and Spread/Median.** According to the table, the number of calories in a cheeseburger at Riverside Diner is 1,120. Since there are an even number of restaurants, the median number of calories in cheeseburgers at





the six restaurants is the average of the two middle values:  $\frac{810+900}{2} = 855$ . The difference between the two is  $1,120 - 855 = 265$  calories, (C).

15. (C) **Math: Multiple-Choice/Coordinate Geometry/Graphs of Quadratic Equations and Relations.** The equations in the answer choices are in the center-radius form  $(x-h)^2 + (y-k)^2 = r^2$ , where point  $(h,k)$  is the center of the circle and  $r$  is the radius. The item stem asks for the equation of a circle with a radius of 3 and a center at  $(4,-2)$ . Therefore, the center-radius equation form of the circle is  $(x-4)^2 + (y+2)^2 = 3^2 = 9$ , (C).
16. (B) **Math: Multiple-Choice/Statistics/Common Data Representations/Frequency Tables and Probability.** Probability is the ratio of the number of desired outcomes to the total number of possible outcomes. According to the table, the number of 9<sup>th</sup>-grade students who had a GPA of 3.0 or greater was  $61 + 95 = 156$ . According to the introductory information, there are 327 ninth-grade students. Therefore, the probability that a 9<sup>th</sup>-grade student chosen at random will have a GPA of 3.0 or greater is  $\frac{156}{327} \approx 0.48$ , (B).
17. (D) **Math: Multiple-Choice/Statistics/Common Data Representations/Frequency Tables and Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Percentages.** According to the table, 61 of the  $61 + 48 = 109$  students enrolled in Propel had a GPA of 3.0 or greater:  $\frac{61}{109}(100) \approx 56\%$ . Similarly, 95 of the  $95 + 123 = 218$  students not enrolled in Propel had a GPA of 3.0 or greater:  $\frac{95}{218}(100) \approx 44\%$ . The difference in the percentages, to the nearest whole percent, is  $56\% - 44\% = 12\%$ , (D).
18. (B) **Math: Multiple-Choice/Statistics/Common Data Representations/Frequency Tables and Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Ratios.** The item stem states that the ratio of boys to girls in the Propel program is 2:3, which corresponds to  $2+3=5$  ratio parts. Divide the total number of students enrolled in Propel ( $61 + 48 = 109$ ) by 5 to find the number of students per ratio part:  $\frac{109}{5} \approx 22$ . Therefore, the total number of girls enrolled in Propel (which corresponds to 3 ratio parts) is approximately  $3(22) = 66$ . The answer that matches best is (B), 65.
- TIP** Don't be distracted by attractive distractors! In this item, don't be distracted by (A), 44, which corresponds to the approximate number of boys enrolled in the program.
19. (C) **Math: Multiple-Choice/Geometry/Triangles/Properties of Triangles, Rectangles and Squares, and Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Creating Algebraic Equations.** If the square has four sides of length  $s$ , the equilateral triangle has three sides of length  $s+2$ . Find the value of  $s$  by setting the perimeter of square as equal to the perimeter of the triangle and solving for  $s$ :  $4s = 3(s+2) = 3s + 6 \Rightarrow s = 6$  inches. Therefore, the length of each rod, which is equal to the perimeter of the square or the triangle, is  $4(6) = 24$  inches, (C).
20. (B) **Math: Multiple-Choice/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Concepts of Domain and Range and Solving Quadratic Equations and Relations/Factoring.** The item stem asks for the expression that is equivalent to the given function and includes the values of  $x$  (as constants or coefficients) that are not part of the domain. Immediately eliminate (C) and (D) because these are not equivalent to the given function. Both (A) and (B) are equivalent, but only (B)

shows the values of  $x$  not included in the domain. That is, the values of  $x$  that make the denominator equal to zero (and the function undefined) are displayed when the quadratic in the denominator is rewritten in factored form:  $2x^2 + 2x - 4 = 2(x^2 + x - 2) = 2(x + 2)(x - 1)$ , so  $f(x) = \frac{2(x - 2)}{2(x + 2)(x - 1)}$ , (B), is equivalent and displays the values of  $x$  not included in the domain.

21. (B) **Math: Multiple-Choice/Algebra/Manipulating Algebraic Expressions/Basic Algebraic Manipulations and Evaluating Expressions.** To determine the effect on  $p$  for an increase in  $A$ , rewrite the given equation

for  $p$  in terms of  $A$ :  $A = 4p + 64 \Rightarrow p = \frac{A - 64}{4}$ . For  $A' = A + 1$ ,  $p' = \frac{A' - 64}{4} = \frac{A + 1 - 64}{4} = \frac{A - 63}{4}$ . The

difference between the new perimeter and the original perimeter is  $\frac{A - 63}{4} - \frac{A - 64}{4} = \frac{A - 63 - A + 64}{4} = \frac{1}{4}$  foot, (B).

22. (D) **Math: Multiple-Choice/Coordinate Geometry/Graphs of Quadratic Equations and Relations.** The  $x$ -coordinate of the vertex of a parabola graphed in the  $xy$ -plane corresponds to a point halfway between the  $x$ -coordinates of the  $x$ -intercepts ( $y = 0$ ),  $-1$  and  $r$ . The vertex has an  $x$ -coordinate of 2, so

$$2 = \frac{-1 + r}{2} \Rightarrow r = 2(2) + 1 = 5, \text{ (D).}$$

23. (D) **Math: Multiple-Choice/Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Functions as Models.** This item asks for the function that best models the described real world scenario. Since the liquid temperature starts at  $100^\circ\text{C}$  (when  $t = 0$ ), the correct function must equal 100 for  $t = 0$ . Only (D) works:  $C = 100 - 15t = 100 - 15(0) = 100$ . Indeed, the liquid temperature

decreases by  $75^\circ\text{C}$  over 5 seconds, which is a rate of  $\frac{-75^\circ\text{C}}{5 \text{ seconds}} = -15^\circ\text{C/second}$  (slope):

$$C(^\circ\text{C}) = 100^\circ\text{C} - \frac{15^\circ\text{C}}{\text{second}} t(\text{seconds}) \Rightarrow C = 100 - 15t, \text{ in degrees Celsius.}$$



Don't oversolve. Just knowing the  $y$ -intercept is 100 is enough to eliminate choices (A), (B), and (C). Don't waste time determining the slope of the line: you know the answer must be (D). Make your selection and move on!

24. (C) **Math: Multiple-Choice/Geometry/Volume and Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Ratios.** The item stem asks how many times larger the volume of Jupiter is than

the volume of Earth, which is the same as the ratio of the two volumes:  $\frac{V_J}{V_E} = \frac{\frac{4}{3}\pi r_J^3}{\frac{4}{3}\pi r_E^3} = \frac{r_J^3}{r_E^3}$ . Since the

radius of Jupiter is 11 times the radius of Earth,  $r_J = 11r_E$ . Therefore,  $\frac{V_J}{V_E} = \frac{r_J^3}{r_E^3} = \frac{(11r_E)^3}{r_E^3} = 11^3 = 1,331$ ,

(C).

25. (B) **Math: Multiple-Choice/Algebra/Evaluating Sequences Involving Exponential Growth.** The item stem states that the population of squirrels "has been doubling every 15 years." In other words, the population increases by 100% every 15 years. This represents exponential growth because the population of squirrels is increasing by the same percentage each 15-year period, (B). Note that if the population had increased by the same amount each period, the correct function would be linear growth.



26. (D) **Math: Multiple-Choice/Algebra/Creating, Evaluating, and Interpreting Algebraic Equations and Functions/Function Notation.** The item stem gives the function  $f(x) = 3x^2 - 5x + 4$  and asks for  $f(x - 4)$ . Replace  $x$  with  $x - 4$  in the original function, simplify, and combine like terms:

$f(x - 4) = 3(x - 4)^2 - 5(x - 4) + 4 = 3(x - 4)(x - 4) - 5x + 20 + 4$ . Use the FOIL method to multiply the binomials and combine like term:  $3(x^2 - 8x + 16) - 5x + 24 = 3x^2 - 24x - 5x + 48 + 24 = 3x^2 - 29x + 72$ , (D).

27. (D) **Math: Multiple-Choice/Algebra/Solving Simultaneous Equations.** Solve the system of equations by substituting  $\frac{1}{3}y$  for  $x$  in the second equation:  $154 - 4y = 10x \Rightarrow 154 - 4y = 10\left(\frac{1}{3}y\right) \Rightarrow$

$154 = \frac{12}{3}y + \frac{10}{3}y \Rightarrow y = \frac{154(3)}{22} = 21$ . Only (D) has a  $y$ -coordinate equal to 21, so (D) must be correct.

Indeed, if  $y = 21$ ,  $x = \frac{1}{3}y = \frac{1}{3}(21) = 7$ .



Don't oversolve. Don't waste time solving for the  $x$ -value; just solving for the  $y$ -value is enough to eliminate three of the answer choices. Make your selection and move on!

28. (65) **Math: Student-Produced Responses/Problem Solving and Advanced Arithmetic/Multi-Step Problem Solving Items and Data Interpretation/Tables.** According to the table, each Szechuan chicken meal has 5 grams of fat and 35 grams of carbohydrates, so 10 Szechuan chicken meals have  $5(10) = 50$  grams of fat and  $35(10) = 350$  grams of carbohydrates. This leaves  $350 - 50 = 300$  grams of fat and  $2,975 - 350 = 2,625$  grams of carbohydrates available for the stir-fry meals. The greatest number of stir-

fry meals that can be purchased without exceeding 300 grams of fat is  $\frac{300 \text{ grams of fat}}{4 \text{ grams of fat / stir-fry meal}} = 75$

stir-fry meals. The greatest number of stir-fry meals that can be purchased without exceeding 2,625

grams of carbohydrates is  $\frac{2,625 \text{ grams of carbs}}{40 \text{ grams of carbs / stir-fry meal}} = 65.625$  stir-fry meals. Partial meals cannot

be bought and neither the fat nor the carbohydrate limit can be exceeded, so the greatest number of stir-fry meals that can be bought is 65.

29. (0, 12) **Math: Student-Produced Responses/Algebra/Solving Simultaneous Equations.** This item presents a system of equations consisting of one linear and one quadratic equation in two variables and asks for the product of the  $x$ - and  $y$ -values of a possible solution. Set the two equations for  $y$  as equal, rewrite in standard quadratic form, and factor the quadratic using the reverse-FOIL method:

$x^2 - 4x + 3 = x - 1 \Rightarrow x^2 - 5x + 4 = 0 \Rightarrow (x - 4)(x - 1) = 0$ . The two values of  $x$  that make this equation true are  $x = 4$  and  $x = 1$ . Substitute one of these into the second equation to determine the corresponding  $y$ -value for that solution: for  $x = 4$ ,  $y = x - 1 = 4 - 1 = 3$ . Therefore, one possible product of  $x$  and  $y$  is

$3(4) = 12$ . For  $x = 1$ ,  $y = x - 1 = 1 - 1 = 0$ , so the second possible product of  $x$  and  $y$  is  $1(0) = 0$ . Either one of these products (0 or 12) is correct.

30. (1368) **Math: Student-Produced Responses/Data Interpretation/Bar, Cumulative, and Line Graphs and Problem Solving and Advanced Arithmetic/Common Problem Solving Items/Percentages.** According to the graph, 180 million pounds of crab was harvested in 2006. Sixty percent of this was sold for \$8 per pound, and 40% was sold for \$7 per pound. Therefore, the total revenue was

$(0.6)(180 \text{ million } \cancel{\text{pounds}}) \left( \frac{\$8}{\cancel{\text{pound}}} \right) + (0.4)(180 \text{ million } \cancel{\text{pounds}}) \left( \frac{\$7}{\cancel{\text{pound}}} \right) = 864 + 504 = 1368$ , in units of millions of dollars.

31. (85) **Math: Student-Produced Responses/Data Interpretation/Bar, Cumulative, and Line Graphs and Problem Solving and Advanced Arithmetic/Common Problem Solving/Proportions and Direct-Inverse Variation.** According to the graph, 80 million pounds of crab was harvested in 2011. Create a proportion between the revenue generated in 2011 at \$17/per pound and the revenue generated in 2012 at

\$16/pound:  $\frac{\$17}{\text{pound}}(80 \text{ million pounds}) = \frac{\$16}{\text{pound}}(x \text{ million pounds})$ . Solve for the unknown x value:

$$x = \frac{17}{16}(80) = 85, \text{ in units of millions of pounds.}$$