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Preliminary SAT/National Merit Scholarship Qualifying Test

Answer Explanations for Practice Test #2

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PSAT/NMSQT Practice Test #2

Reading Test Answer Explanations

Question 1

Choice A is the best answer. Falvo believes that when trying something new it's important to not overdo it. This can be seen most clearly when Falvo admonishes the newest runner to control his impulses and not to run too fast or try too hard when racing with more experienced runners: "I don't want you doing anything stupid, Mosher. Some of these boys have been at it for a while. Don't think about them, think about yourself" (lines 19-22).

Choice B is incorrect because McCann is described as a "tough-looking kid [who] smiled like a gunslinger" (lines 17-18), implying that he is a risk-taker who is likely to push limits. Choice C is incorrect because in the passage Mosher pushes himself until he makes himself physically sick. Choice D is incorrect because the person who said "let him go" was watching Mosher "stagger" past after he had already pushed himself past his limits.

KEY: A

DIFFICULTY: Easy

Question 2

Choice B is the best answer. The previous question asks which character believes one shouldn't push his or her limits when trying something new: the running coach Falvo. The best evidence in support of that choice is lines 19-22, when Falvo instructs Mosher to control himself when running with the experienced racers by saying "I don't want you doing anything stupid, Mosher. Some of these boys have been at it for a while. Don't think about them, think about yourself."

Choice A is incorrect because while lines 14-17 show Falvo encouraging McCann not to "drain the well," they do not address the issue of McCann "trying something new," which is a central part of the previous question. Choices C and D are incorrect because lines 55-60 and 76-79 both show that Mosher pushed himself too hard, not that he controlled himself.

KEY: B

DIFFICULTY: Medium

Question 3

Choice B is the best answer. "Pace yourself. Let them do what they do. They'll be about thirty yards ahead after the first lap. Don't worry about them. Go out slow, feel your way, then bring it home as best you can. OK?" (lines 24-27). These lines indicate Falvo believes Mosher should run for himself and not focus on what the other, more experienced runners in the time trial are doing. The main

KEY: B

DIFFICULTY: Medium

purpose of these lines is to reemphasize what Falvo had said earlier in the passage about not overdoing it when trying new things.

Choice A is incorrect because lines 24-27 were addressed specifically to Mosher, not the group. Choice C is incorrect because lines 24-27 are instructions to one runner about a specific race. Choice D is incorrect because lines 24-27 do not reveal anything about Falvo's beliefs as much as they repeat or reemphasize what he had said earlier.

Question 4

Choice B is the best answer. In the passage, the narrator, Mosher, shrugged after Falvo told him not to do anything stupid and then said “sure” when the coach warned him not to worry about the other runners, responses that both indicate that Mosher was ignoring the coach's advice (or being dismissive of it).

Choices A, C, and D are incorrect because when Mosher shrugs at or offers a one-word response to the coach's advice, it can be inferred that he is simply ignoring it, not that he is a shy, dishonest, or hostile person.

KEY: B

DIFFICULTY: Easy

Question 5

Choice C is the best answer. Falvo's advice to the runners at the beginning of the passage was not to push themselves too hard. Even if the more experienced runners did not verbally respond to that advice, it's clear they followed it because their running was described throughout the passage as having a “quiet, aggressive, sustained power that looked like nothing” (lines 38-39) and being as “smooth as water” (line 42). When passing Mosher on the track, those runners were also said to be “all business now” (line 55), describing efficiency without too much effort; those runners were not pushing themselves too hard.

Choices A, B, and D are incorrect because the passage never states how the more experienced runners responded to Falvo's advice (except for McCann's smiling at the idea he shouldn't “drain the well” that day), so it's impossible to know if those runners were enthusiastic about it, ignored it, or only pretended to heed it. However, the way those racers were said to have run the time trial (“all business”) does show that they generally accepted what their coach had said.

KEY: C

DIFFICULTY: Medium

Question 6

Choice D is the best answer. The passage makes clear that Mosher ignores Falvo's advice to stay contained as a runner during the time trial. Later he makes it clear that he had no idea why he hadn't

KEY: D

DIFFICULTY: Hard

followed Falvo's advice: "I don't know why. I can't explain it" (line 61).

Choices A, B, and C are incorrect because line 61 is explicit in stating that the narrator did not have a good reason to ignore Falvo's advice, not that he did so just because he was determined to keep up with the other runners, wanted to prove something to himself, or wanted to improve on his previous time.

Question 7

Choice B is the best answer. The previous question asks for Mosher's motivation for pushing himself too hard in the time trial. In line 61, Mosher offers no concrete explanation for why he ran the time trial the way he did: "I don't know why. I can't explain it."

Choice A is incorrect because lines 36-39 describe the other runners in the time trial but not the narrator. Choice C is incorrect because lines 73-76 explain Mosher's physical condition, not his internal motivation, at the end of the time trial. Choice D is incorrect because lines 91-94 explain Falvo's reaction to Mosher's race.

KEY: B

DIFFICULTY: Hard

Question 8

Choice A is the best answer. Falvo says to the exhausted Mosher: "'What we have here,' he was saying, 'is a failure to communicate. Stay within yourself, I said. Don't drain the well, I said'" (lines 81-83). By then Mosher had pushed himself so hard that he'd become physically ill and used up all his energy.

Choice B is incorrect because "don't drain the well" means don't use up the valuable energy one has, not "don't get sick." Choices C and D are incorrect because in the passage Falvo tells Mosher to maintain his own pace and run his own race, not that he should be concerned with the other runners or that he shouldn't quit if tired.

KEY: A

DIFFICULTY: Easy

Question 9

Choice D is the best answer. Lines 88-89 state "He laughed—that bitter Falvo laugh—ha!—like he'd just been vindicated." "Vindicated" means to be justified or proven correct, which is apt in this context because by running himself into sickness and exhaustion, Mosher had proven correct Falvo's belief that Mosher might overdo it.

Choice A is incorrect because "avenged" means to exact vengeance or satisfaction. Choices B and C are incorrect because in this passage no one is either set free or defended against; rather, Falvo is simply proven correct that Mosher might push too hard in the time trial.

KEY: D

DIFFICULTY: Medium

Question 10

Choice A is the best answer. The passage begins with “the number of democracies in the world today is unprecedented” and then continues in the second paragraph by providing the specific numbers in support of that claim: lines 17-20 state that in 2011, 117 of 193 countries were identified as electoral democracies but that only 69 of 167 countries had been so labeled in 1989. Beginning in line 23, however, the passage moves away from the simple claim that the number of political democracies in the world was increasing (unprecedented) and begins to analyze the reason for that change: “What caused this global transformation?” The remainder of the passage then focuses more closely on the reasons there are more democracies today, including the “local factors” (line 24) involved, “poor economic management by many authoritarian governments” (lines 26-27), and “new reach and speed of mass media” (lines 37-38).

Choice B is incorrect because the passage doesn't claim there is less political openness in the world but more. **Choice C** is incorrect because the passage doesn't start with one set of data and then switch to a conflicting set. **Choice D** is incorrect because the passage neither supports nor denounces either democracies or autocracies but simply discusses their increasing and/or decreasing numbers in the modern world.

KEY: A

DIFFICULTY: Medium

Question 11

Choice D is the best answer. Lines 17-20 state that in 2011, 117 of 193 surveyed countries were identified as electoral democracies but that only 69 of 167 countries were labeled as such in 1989. Then those statistics are further explained by being “put another way” (line 20), or stated another way.

Choices A, B, and C are incorrect because to “put” the statistics in lines 17-20 “another way” means to explain or state them another way, not to inflict something on someone by will or force (“impose”), physically set something up (“place”), or encourage or arouse (“incite”).

KEY: D

DIFFICULTY: Easy

Question 12

Choice D is the best answer. Lines 30-31 explain that one way democracy was supported around the world was that “Western governments and activists encouraged dissent and held out rewards for reform.” In this context, the rewards being “held out” (line 31) means the rewards being offered.

Choices A, B, and C are incorrect because the rewards being “held out” by Western governments and activists refer to the rewards

KEY: D

DIFFICULTY: Easy

being offered, not that those rewards were being resisted, awaited, or avoided.

Question 13

Choice D is the best answer. Lines 56-59 state that “according to one study of the world’s democratic electoral systems, Brunei may be the only country where ‘electoral politics has failed to put down any meaningful roots at all.’” These lines support the claim that there’s been a global trend toward political openness as they make clear that there’s only one country on Earth (Brunei) where such openness cannot be found.

Choice A is incorrect because line 23 asks a question related to the proportion of democracies in the world but nothing about “political openness.” Choice B is incorrect because lines 26-27 explain one reason authoritarian regimes have failed. Choice C is incorrect because lines 41-42 address the factor of the modern media in politics.

KEY: D

DIFFICULTY: Hard

Question 14

Choice A is the best answer. While the passage states and supports the idea that there are more democracies and fewer autocracies in the world today, it further explains that, perhaps surprisingly, even those autocracies are becoming more open: “With far fewer repressive regimes in the world, one might have expected the holdouts to be places where freedom and political competition are increasingly suppressed. But in fact the opposite is true” (lines 59-63).

Choices B, C, and D are incorrect because in lines 59-63, the passage explicitly supports the idea that freedom in modern autocracies is not being “increasingly suppressed” (“in fact the opposite is true”), but the passage says nothing about conflicting data and opinion polls regarding life in those autocracies (choice B), that democracy has faced a number of local setbacks (choice C), or that political openness in autocratic countries has declined (choice D).

KEY: A

DIFFICULTY: Medium

Question 15

Choice C is the best answer. The previous question asks about the unexpected state of political openness in autocratic regimes, with lines 59-63 clearly explaining that there is more political openness to be found in those regimes than might have been assumed: “With far fewer repressive regimes in the world, one might have expected the holdouts to be places where freedom and political competition are increasingly suppressed. But in fact the opposite is true.”

KEY: C

DIFFICULTY: Hard

Choices A, B, and D are incorrect because the previous question asks about how politically open modern autocratic regimes tend to be, but lines 18-22 discuss the proportion of democracies in the world today; lines 46-50 describe shifts in public attitudes toward democracy; and lines 73-77 analyze reasons why some political autocracies may have changed.

Question 16

Choice B is the best answer. Lines 63-64 explain that while elections are central to democracy, other indicators of the openness of a society include “freedom of the press, civil liberties, [and] checks and balances that limit the power of any single institution” (lines 65-67).

Choices A, C, and D are incorrect because “freedom of the press” is clearly cited in line 65 as being an indicator of political openness, but the passage says nothing similar about a strong head of state, confidence in the military, or the presence of a digital culture.

KEY: B

DIFFICULTY: Medium

Question 17

Choice D is the best answer. While the graph shows there were more than 80 autocracies around the world in 1975, that number is smaller than the number of democracies (nearly 100) that the graph shows existed in 2011.

Choice A is incorrect because the graph shows that approximately only 20 democracies existed in 1950. Choice B is incorrect because the graph shows that fewer than 80 democracies existed in 1995. Choice C is incorrect because the graph shows that approximately only 20 autocracies existed in 2011.

KEY: D

DIFFICULTY: Easy

Question 18

Choice B is the best answer. The graph shows the lines representing the number of autocracies and the number of democracies intersecting between 1985 and 1990, when there were approximately 60 of each of those types of government around the world.

Choice A is incorrect because the graph shows there were more autocracies than democracies in the world from 1975 to 1980.

Choices C and D are incorrect because the graph shows there were more democracies than autocracies in the world from 1995 to 2000 and 2005 to 2010.

KEY: B

DIFFICULTY: Easy

Question 19

Choice A is the best answer. The first paragraph states the main idea: “Researchers have found that the reintroduction of the gray wolf to Yellowstone National Park has boosted an important food source for the threatened grizzly bear. A study published in the *Journal of Animal Ecology* is essentially a tale of who eats what” (lines 3-7). The remainder of the passage then explains how adding gray wolves back into the Yellowstone food web affected various plant and animal species (elk, grizzly bears, fruit-bearing shrubs, aspen, and cottonwood trees), with the main purpose of the passage therefore summarized as a discussion of an ecological phenomenon.

Choices B, C, and D are incorrect because the passage is a full discussion of a certain ecological phenomenon (what happened when gray wolves returned to Yellowstone) and does not specifically mention any scientific experiment, environmental debate, or historic discovery.

KEY: A

DIFFICULTY: Medium

Question 20

Choice C is the best answer. Lines 8-15 of the passage highlight what happened in Yellowstone after wolves were introduced back into the park: “When wolves were reintroduced to the park in 1995 after a 70-year absence, they preyed on elk herds that browsed trees and shrubs. The elk population, which had exploded without the wolves, dropped. The over-browsed plants began to rebound, including berry-producing shrubs that provide nutritious summer meals for grizzlies when they are fattening up for hibernation.” In other words, when the reintroduced wolves began to prey on elk herds, fewer grazing elk led to an increase in fruit-bearing plants found in the area.

Choice A is incorrect because even though the passage discusses a study of the ecology in Yellowstone National Park after the reintroduction of wolves, neither the study nor any investigation of grizzly bears occurred specifically due to the drop in the elk population. Choice B is incorrect because the passage states that fewer elk in Yellowstone led to a resurgence of aspen trees, not a decrease in their numbers. Choice D is incorrect because the drop in the elk population in Yellowstone did not result in a surge in the wolf population there; rather, the addition of wolves to the park resulted in the drop in the elk population.

KEY: C

DIFFICULTY: Medium

Question 21

Choice B is the best answer. The previous question asks about a direct result of the decrease in elk population in Yellowstone National Park, with the answer being that fewer grazing elk meant

KEY: B

DIFFICULTY: Medium

more fruit-bearing plants. That idea is supported in lines 12-15: “The over-browsed plants began to rebound, including berry-producing shrubs that provide nutritious summer meals for grizzlies when they are fattening up for hibernation.”

Choices A and D are incorrect because lines 6-7 and 49-50 address the study in question but not a direct result of the decrease in elk population in Yellowstone. Choice C is incorrect because while lines 42-46 discuss the resurgence of certain trees in Yellowstone that occurred when the elk population decreased, those lines do not support the answer to the previous question that fewer elk led to more fruit-bearing plants.

Question 22

Choice D is the best answer. The passage specifically mentions one potential challenge to the survival of grizzly bears in lines 50-53:

“In the case of the grizzly, the paper’s authors said increasing berry production could help make up for the loss of another bear food threatened by climate change, whitebark pine nuts.”

Choices A, B, and C are incorrect because lines 50-53 specifically identify dwindling whitebark pine nuts as a potential threat to grizzly bear survival but the passage says nothing similar about elk, beetles, or cottonwood trees.

KEY: D

DIFFICULTY: Easy

Question 23

Choice B is the best answer. The previous question asks what the passage identifies as a possible challenge to grizzly bear survival, with lines 50-53 explaining the answer that the loss of a food source could prove problematic for that species: “In the case of the grizzly, the paper’s authors said increasing berry production could help make up for the loss of another bear food threatened by climate change, whitebark pine nuts.”

Choice A is incorrect because lines 27-30 discuss the proportion of fruit found in grizzly bear scat over a certain time period. Choices C and D are incorrect because lines 59-60 and 60-62 discuss the return of fruit-bearing plants in Yellowstone, a change that would not threaten the grizzly bear but benefit it.

KEY: B

DIFFICULTY: Medium

Question 24

Choice D is the best answer. Lines 8-10 of the passage state that “when wolves were reintroduced to the park in 1995 after a 70-year absence, they preyed on elk herds that browsed trees and shrubs.” In this context, saying the elk herds “browsed” on trees and shrubs means they ate them or grazed on them.

KEY: D

DIFFICULTY: Medium

Choices A, B, and C are incorrect because in this context, saying the elk herds “browsed trees and shrubs” means they ate those trees and shrubs, not that the elk inspected, skimmed, or destroyed the trees and shrubs.

Question 25

Choice C is the best answer. Lines 60-62 of the passage offer one scientist’s opinion that the return of berry-producing shrubs may not solve all the grizzlies’ food problems: “It may not be a panacea or a big silver bullet as a food item for the grizzlies.” A “panacea” is a cure-all, so saying the return of berry-producing shrubs may not be a “big silver bullet” means that the return of those shrubs may not be a definitive solution for the grizzlies’ food problems.

Choices A, B, and D are incorrect because in the context of this sentence, the “big silver bullet” is equated to a panacea or cure-all; the phrase is clearly meant to imply a definitive solution, not an unexpected outcome, tempting choice, or dangerous event.

KEY: C

DIFFICULTY: Medium

Question 26

Choice B is the best answer. The passage concludes in lines 63-69 by stating that the story of the gray wolf’s return to Yellowstone may be more than just the story of one animal: “The wolf-bear connection in Yellowstone offers a broader lesson, Ripple said. ‘We should be looking much farther and much more holistically at large mammal or predator management,’ he suggested. ‘There could be far reaching effects that we have not considered in the past. And they can be very important.’” The main purpose of the final paragraph can therefore be seen as a lesson that what happened to the gray wolves in Yellowstone could happen with other large mammal species in other places.

Choices A, C, and D are incorrect because the final paragraph is clear that the story of the gray wolf’s return to Yellowstone could have far-reaching effects in studying animal ecology, not that there may have been limitations to the scientist’s conclusions, that another experiment will be undertaken in the future, or that there may be potential ramifications to returning another species to some ecosystems.

KEY: B

DIFFICULTY: Medium

Question 27

Choice B is the best answer. The table shows a decrease in the wolf/elk ratio between the years 1999 (4.09) and 2000 (3.03).

Choices A, C, and D are incorrect because the table shows an *increase* in the wolf/elk ratio between the years 1998 (2.73) and 1999 (4.09); 2000 (3.03) and 2001 (5.37); and 2003 (9.12) and 2004 (12.72).

KEY: B

DIFFICULTY: Medium

Question 28

Choice A is the best answer. The passage's claim that the reintroduction of gray wolves to Yellowstone National Park led to an overall decline in the number of elk is supported by the table, which shows the number of winter elk in Yellowstone going from more than 16,000 in 1995 to only about 8,000 in 2004.

Choice B is incorrect because the table shows that while the number of elk went down most years after the reintroduction of the gray wolf, it actually went *up* between the years 1998 (11,736) and 1999 (11,742) and the years 1999 (11,742) and 2000 (14,539). Choice C is incorrect because, while the table shows the wolf/elk ratio increasing between 1998 and 1999 (from 2.73 to 4.09), the number of elk actually increased those years too (from 11,736 to 11,742). Choice D is incorrect because the table clearly shows that the stabilization of wolf numbers in Yellowstone ultimately led to a reduction in the overall number of elk (from about 16,000 in 1995 to 8,000 in 2004), not a stabilization of the elk population.

KEY: A

DIFFICULTY: Medium

Question 29

Choice D is the best answer. In the second paragraph, Thoreau discusses men who blindly serve the state or government without considering how just their actions might be. In the context of saying these types of men “command no more respect than men of straw or a lump of dirt” (lines 22-23), Thoreau uses the word “command” to mean “deserve.”

Choices A, B, and C are incorrect because in the context of saying certain men don't command respect, Thoreau means they haven't earned it or don't deserve it, not that they ordered, dominated, or overlooked that respect.

KEY: D

DIFFICULTY: Hard

Question 30

Choice B is the best answer. In lines 30-34, Thoreau explains what happens to the people who follow their consciences instead of blindly adhering to the possibly unjust rules of the state: “A very few, as heroes, patriots, martyrs, reformers in the great sense, and *men*, serve the state with their consciences also, and so necessarily resist it for the most part; and they are commonly treated as enemies by it. . . .” As those heroes are said to resist the state and are treated as enemies by it, it would be accurate to characterize the relationship between the two as mutually antagonistic.

Choice A is incorrect because while Thoreau says “a corporation of conscientious men” forming a “corporation *with* a conscience” is possible (lines 7-10), he does not suggest such organizations often occur. Choices C and D are incorrect because at no point in the

KEY: B

DIFFICULTY: Hard

passage does Thoreau refer to conscientious people's moral sense as making them human or suggest that such people hold legislators to a different moral standard than they hold themselves.

Question 31

Choice D is the best answer. The previous question asks what point Thoreau makes about the people who follow their consciences, with the answer being that those people usually resist the state and end up its enemies. The best evidence in support of that answer is found in lines 30-34, which state, "A very few, as heroes, patriots, martyrs, reformers in the great sense, and *men*, serve the state with their consciences also, and so necessarily resist it for the most part; and they are commonly treated as enemies by it. . . ."

Choice A is incorrect because lines 1-2 ask a rhetorical question but do not identify the point Thoreau makes about people who follow their conscience. Choice B is incorrect because lines 7-10 address corporations with a conscience, not people. Choice C is incorrect because lines 17-21 address people who do not follow their conscience but adhere blindly to the rules of the state instead.

KEY: D

DIFFICULTY: Hard

Question 32

Choice A is the best answer. Lines 53-55 explain that King does not believe unjust laws and statutes should be followed or have any moral authority: "Conversely, one has a moral responsibility to disobey unjust laws. I would agree with St. Augustine that 'an unjust law is no law at all.'"

Choice B is incorrect because at no point does King ever argue to do anything simply to attract attention. Choice C is incorrect because King says "any law that degrades human personality is unjust" (lines 64-65), which is the opposite of saying an unjust law is not detrimental to the human spirit. Choice D is incorrect because King says an unjust law is "out of harmony with the moral law" (line 60), not that an unjust law should be used to enforce moral law.

KEY: A

DIFFICULTY: Hard

Question 33

Choice C is the best answer. The previous question asks how King characterizes unjust statutes, with lines 53-55 providing evidence in support of the idea that King believed those statutes have no moral authority: "one has a moral responsibility to disobey unjust laws. I would agree with St. Augustine that 'an unjust law is no law at all.'"

Choice A is incorrect because lines 49-50 highlight what King considers the two different types of laws, just and unjust. Choice B is incorrect because lines 51-52 explain King's belief that one has a

KEY: C

DIFFICULTY: Hard

responsibility to follow *just* laws. Choice D is incorrect because lines 64-65 explain King’s definition of what makes a law unjust but not how he believes people should respond to such a law.

Question 34

Choice A is the best answer. Lines 57-58 ask the question “How does one determine whether a law is just or unjust?” In this context, to “determine” whether a law is just means to establish whether a law is just.

Choices B, C, and D are incorrect because in the context of trying to determine whether a law is just or unjust, the word “determine” means to establish what the law is, not regulate, direct, or limit it.

KEY: A

DIFFICULTY: Easy

Question 35

Choice A is the best answer. The main purpose of each passage is to argue how individuals should respond to the law (especially unjust laws). Thoreau says that people of conscience need to become enemies of the state and King believes that “an unjust law is no law at all” (lines 54-55). That the primary purpose of each passage is to discuss the relationship between the individual and law can be seen from the first sentence of the Thoreau passage: “Must the citizen ever for a moment, or in the least degree, resign his conscience to the legislator?” (lines 1-2) and the last sentence of the King passage: “I submit that an individual who breaks a law that conscience tells him is unjust, and who willingly accepts the penalty of imprisonment in order to arouse the conscience of the community over its injustice, is in reality expressing the highest respect for law” (lines 79-84).

Choices B, C, and D are incorrect because neither passage forwards a view on how to make laws more just (only on how people of conscience should respond to them), equates the morality of actions with their consequences, or discusses ways the state’s power over an individual may change.

KEY: A

DIFFICULTY: Medium

Question 36

Choice C is the best answer. Both Thoreau and King argue that having respect for existing law does not mean one necessarily acts justly, and the people who blindly follow all rules aren’t always acting in accordance with justice. “Law never made men a whit more just; and, by means of their respect for it, even the well-disposed are daily made the agents of injustice” (Thoreau, lines 10-13). King echoes Thoreau’s sentiment: “and I can urge them to disobey segregation ordinances, for they are morally wrong” (King, lines 71-73).

KEY: C

DIFFICULTY: Hard

Choices A, B, and D are incorrect because King does not discuss in detail the consciences, the moral judgment, or the personal moral values of law-abiding people.

Question 37

Choice B is the best answer. In lines 6-7, Thoreau argues that people should first follow their consciences: “The only obligation which I have a right to assume is to do at any time what I think right.” King, on the other hand, suggests that it is not conscience that must be heard first but something else: “One has not only a legal but a moral responsibility to obey just laws” (lines 51-52). A significant difference between the two could therefore be identified as Thoreau’s emphasis on the importance of conscience and King’s emphasis on morality.

Choice A is incorrect because Thoreau suggests that few people follow their consciences. “Must the citizen . . . resign his conscience to the legislator?” (lines 1-2). King differentiates between just and unjust laws (lines 50-54) but never suggests how many people might or might not “adhere to moral law.” Choice C is incorrect because Thoreau argues that legality was secondary to conscience, not that conscience (or morality) resulted from legality. Choice D is incorrect because Thoreau does not suggest “good laws” should be disobeyed; he actually says the opposite.

KEY: B

DIFFICULTY: Hard

Question 38

Choice C is the best answer. Lines 77-79 expressly state how King believes one should respond to unjust laws: “One who breaks an unjust law must do so openly, lovingly, and with a willingness to accept the penalty.” This suggests King would recommend that if Thoreau were truly against slavery, he should publicly break those laws and then willingly accept whatever consequences might result.

Choices A, B, and D are incorrect because King explicitly states in the passage that people have a moral responsibility to *disobey* unjust laws. King would not recommend that Thoreau obey unjust laws while working to change them (choice A), uphold unjust laws (choice B), or uphold unjust laws he is critical of (choice D).

KEY: C

DIFFICULTY: Medium

Question 39

Choice C is the best answer. The passage first identifies an agricultural problem: “Consider the western corn rootworm—a beetle that’s a serious pest of corn in the United States” (lines 7-8). By the conclusion of the passage, however, the way the rootworm’s “gut bacteria” (lines 49-50) aided the insect’s survival in both corn and soybean fields has been fully explained: “The team proved that

KEY: C

DIFFICULTY: Medium

the bacteria were responsible by killing them with antibiotics. Sure enough, this drastically lowered the cysteine protease activity in the guts of the rotation-resistant beetles and wrecked their ability to thrive among soybeans” (lines 65-69). Overall, the passage can therefore be summarized as having a focus shifting from the identification of an agricultural problem to an explanation of its cause.

Choice A is incorrect because the passage does not state that the challenge posed by the western corn rootworm was easy to overcome. Choice B is incorrect because the passage provides virtually no biographical information about the scientists involved (other than the fact they worked at the University of Illinois). Choice D is incorrect because while the passage ends its first paragraph by stating the belief that “zoology is ecology,” it otherwise does not discuss any particular scientific field.

Question 40

Choice C is the best answer. The first paragraph of the passage says that animals aren’t just animals but collections of microbes, with the remainder of the passage going on to explain that scientists found the way to control the western corn rootworm only after coming to understand its gut bacteria. The statement “zoology is ecology” (line 6) implies that the study of animals (zoology) is really the study of ecology (the relationship between organisms), as is shown to be the case through the example of the western corn rootworm’s relationship with its gut bacteria. In other words, it asserts a general point that is supported by an example.

Choices A, B, and D are incorrect because the phrase “zoology is ecology” in line 6 means that the study of animals is greatly affected by studying the ways organisms interact (i.e., the way the western corn rootworm’s gut bacteria has affected its growth and survival), not that those two fields of study should be merged, that knowledge obtained in one of those fields would lead to expertise in the other, or that one of those fields supplanted another.

Question 41

Choice B is the best answer. Normal rootworms lay their eggs in corn fields “so that their underground larvae hatch into a feast of corn roots” (lines 10-11). “These rotation-resistant females might lay among soybean fields, so their larvae hatch into a crop of corn” (lines 20-22). Combined, these statements indicate a similarity: both normal and rotation-resistant rootworms produce larvae whose first food will be the roots of crops.

Choice A is incorrect because the passage doesn’t state that either type of rootworm reduces crop productivity by extracting nutrients

KEY: C

DIFFICULTY: Hard

KEY: B

DIFFICULTY: Medium

from the soil. Choice C is incorrect because the passage clearly states that in the face of crop rotation, the normal rootworm will die rather than adapt. Choice D is incorrect because the passage says the normal and rotation-resistant rootworms have very different gut bacteria.

Question 42

Choice B is the best answer. The passage states that one way farmers have tried to eradicate the western corn rootworm is by rotating their crops (thereby reducing the viable fields for the rootworms), with the question of how some rootworms have overcome that problem being specifically answered in lines 18-20: “But the rootworms have adapted to this strategy by reducing their strong instincts for laying eggs in corn.”

Choices A, C, and D are incorrect because the lines cited do not specifically answer the question of how some rootworms have overcome the farmers’ efforts to eradicate them. Rather, lines 15-17 provide one way the farmers have been able to eradicate rootworms; lines 25-28 explain some of the challenges being faced by researchers studying the rootworm; and lines 41-43 identify a problem for the rootworms, not how these beetles have adapted to the farmers’ eradication efforts.

KEY: B

DIFFICULTY: Medium

Question 43

Choice A is the best answer. The point of the fourth paragraph is to explain how hard it was for scientists to determine what made the rotation-resistant rootworms different from the normal ones. “After many years of research [focused on genes] . . . results were mostly inconclusive” (lines 33-35).

Choices B, C, and D are incorrect because the central claim of the fourth paragraph is simply that many years of research led to only “inconclusive” results about differences between rotation-resistant and normal rootworms. Neither that paragraph nor any part of the passage claims that the rootworm’s adaptation ability is unique, that its genetic make-up was more complex than originally thought, or that inadequate understanding of genetics in general was the reason the rootworm remained such a mystery.

KEY: A

DIFFICULTY: Medium

Question 44

Choice A is the best answer. “There are almost certainly genetic differences that separate the rotation-resistant rootworms from their normal peers, but what are they?” (lines 23-25). In the context of genetic differences separating two types of insects, the word “separate” means to distinguish or differentiate.

KEY: A

DIFFICULTY: Easy

Choices B, C, and D are incorrect because in the context of genetic differences separating two types of rootworms, “separate” means to distinguish or differentiate, not to discharge, extract, or scatter.

Question 45

Choice A is the best answer. After the passage states that normal rootworms can’t survive in soybean fields but that rotation-resistant rootworms can, it explains that the difference between the two is their respective gut bacteria. Lines 54-55 state that “these different microbes give the resistant beetles an edge when eating soybeans.”

Choice B is incorrect because the passage says that gut bacteria in rotation-resistant rootworms results in more cysteine proteases in their stomachs, not fewer. Choice C is incorrect because in the passage antibiotics are being used to kill microbes (or gut bacteria) only, not the rootworms themselves. Choice D is incorrect because the passage never mentions anything being transferred to the larvae.

KEY: A

DIFFICULTY: Medium

Question 46

Choice D is the best answer. The previous question asks what the gut bacteria of rotation-resistant rootworms do, with the correct answer being that they allow that variation of beetle to survive in the soybean fields where normal rootworms cannot. This answer is supported specifically in lines 54-55, which state that “these different microbes give the resistant beetles an edge when eating soybeans.”

Choices A, B, and C are incorrect because the lines cited do not explain what the gut bacteria of rotation-resistant rootworms do. Rather, lines 29-30 explain that understanding the western corn rootworm was a challenge to researchers; lines 39-40 state only that normal rootworms and rotation-resistant ones have very different microbes in their stomachs; and lines 44-47 explain that the difference in rootworms was not so much simple genetics as a multispecies conspiracy.

KEY: D

DIFFICULTY: Medium

Question 47

Choice C is the best answer. The main idea of the last paragraph is that it is the gut bacteria of rotation-resistant rootworms that allow them, but not normal rootworms, to thrive in soybean fields. “The team proved that the bacteria were responsible by killing them with antibiotics. Sure enough, this drastically lowered the cysteine protease activity in the guts of the rotation-resistant beetles and wrecked their ability to thrive among soybeans” (lines 65-69).

KEY: C

DIFFICULTY: Medium

Choice A is incorrect because the second-to-last paragraph of the passage says cysteine proteases allow rootworms to survive in soybean fields, not that they are in any way harmful to the rootworms. Choice B is incorrect because the eggs laid by rotation-resistant rootworms among soybeans will hatch into crops of corn, not of soybeans. Choice D is incorrect because the passage clearly states that rotation-resistant rootworms *do* use cysteine proteases to digest soybeans, not that they do not use them for that task.

Writing and Language Test

Answer Explanations

Question 1

Choice D is the best answer because the pronoun “it” in the independent clause that begins “it has been . . .” needs the antecedent “coffee.” The passive voice phrase “coffee was introduced” is acceptable in this context because indicating who introduced coffee to Italy is not important to the passage.

Choices A, B, and C are incorrect because each results in a vague or ambiguous pronoun (“it,” “they,” “their”).

KEY: D

DIFFICULTY: Easy

Question 2

Choice B is the best answer because the phrase “in fact” signals the relationship between the preceding sentence, which states a fact (coffee “has been a ubiquitous part of Italian culture”), and the following sentence, which provides evidence for the fact (“one cannot visit . . .”).

Choices A, C, and D are incorrect because these transitional expressions don’t signal an accurate relationship between the two sentences they connect. “However,” “even so,” and “despite” indicate that a contrast will follow, not support for a previous statement.

KEY: B

DIFFICULTY: Easy

Question 3

Choice C is the best answer because the plural pronoun “they” agrees in number with the plural noun “coffeehouses,” and the plural verb “have become” is used correctly to show that the action is current and ongoing.

Choices A and B are incorrect because the singular pronoun “it” does not agree in number with the plural noun “coffeehouses.” Choice D is incorrect because the helping verb “had” cannot describe an action that began in the past and continues into the present.

KEY: C

DIFFICULTY: Hard

Question 4

Choice C is the best answer because the subjective pronoun “who” is used correctly as the subject of the clause to refer to those people who frequent coffeehouses, and the plural verb “love” agrees with the plural pronoun “those.”

Choice A is incorrect because “which” is not the correct pronoun to use when referring to people. Choice B is incorrect because “loves” is a singular verb and a plural one is needed to agree with the plural

KEY: C

DIFFICULTY: Medium

pronoun “those.” Choice D is incorrect because “whom” is the objective case of the pronoun; in this instance the subjective case “who” is needed.

Question 5

Choice B is the best answer because the singular present tense verb “contributes” agrees with the singular noun “way” and is consistent with the previous verb in the sentence, “functions.”

Choice A is incorrect because the plural verb “contribute” doesn’t agree in number with the singular noun “way.” Choice C is incorrect because it offers a participle instead of the basic present tense verb needed for the clause. Choice D is incorrect; the pronoun “which” is unnecessary since a clause isn’t being introduced.

KEY: B

DIFFICULTY: Medium

Question 6

Choice B is the best answer because the example of a fee that is “three to four times as much as the price per drink” most clearly supports the statement that coffeehouses “charge a premium for table service.”

Choices A, C, and D are incorrect because they do not support or explain what “charge a premium” means. Choice A focuses on being able to sit and rest; choice C focuses on the surprise of tourists; and choice D focuses on being waited on at a table.

KEY: B

DIFFICULTY: Hard

Question 7

Choice A is the best answer because it most concisely and clearly combines the two sentences (the two sentences need to be combined because “They do this” is a clunky beginning for the second sentence). The new sentence is clear in its description of standing at a coffeehouse bar and being physically very close to others drinking coffee at the bar.

Choices B, C, and D are incorrect either because they are wordy or because the syntax does not result in a cohesive sentence.

KEY: A

DIFFICULTY: Medium

Question 8

Choice B is the best answer because it provides a transition from the previous paragraph’s focus on “the coffee-drinking experience” to the topic of this paragraph, “the making of” coffee “and the timing of its consumption.”

Choices A, C, and D are incorrect either because they don’t provide a transition between the topics of the two paragraphs or because they include irrelevant information.

KEY: B

DIFFICULTY: Medium

Question 9

Choice A is the best answer because the adjective “correct” is clear and concise.

Choices B, C, and D are incorrect because they all include redundant words. “Correct,” “proper,” “properly,” and “appropriate” all convey the same idea, and any combination of these words should not be used together.

KEY: A

DIFFICULTY: Medium

Question 10

Choice D is the best answer because two commas are necessary to set off a transitional phrase such as “for example” when it is used in the middle of a sentence.

Choices A, B, and C are incorrect because they all include incorrect punctuation. When needed, commas should be used in pairs to set off transitions and cannot be partnered with colons or dashes.

KEY: D

DIFFICULTY: Medium

Question 11

Choice D is the best answer because the sentence should not be added. The passage focuses on coffee drinking in Italy and this suggested addition is about the United States. Choice D correctly addresses the reason the sentence should not be added: “because it digresses from the main topic.”

Choices A and B are incorrect because they result in adding a sentence that does not fit with the passage. Choice C is incorrect because it gives a reason that is not supported by the passage.

KEY: D

DIFFICULTY: Easy

Question 12

Choice B is the best answer because a comma is needed to connect the independent clause “Each year . . . Arctic” to the appositive that follows (“A journey . . . fuel up”).

Choices A and C are incorrect because a period or semicolon can’t be used to connect an independent clause to an appositive. Choice D is incorrect because a semicolon should be used to connect two independent clauses, not an independent clause and a dependent clause or phrase.

KEY: B

DIFFICULTY: Hard

Question 13

Choice C is the best answer because a comma and a conjunction are needed to connect the independent clauses “and the Arctic . . . the year” and “the shorebirds . . . pilgrimage.” Additionally, a verb (“fail”) is needed to complete the second independent clause, not a participle (“failing”).

KEY: C

DIFFICULTY: Easy

Choice A is incorrect because a participle cannot be used to replace the basic present tense verb “fail.” Choice B is incorrect because a conjunction is needed between the independent clauses. Choice D is incorrect because if a semicolon is used, what follows must be an independent clause.

Question 14

Choice C is the best answer because a pair of commas is needed to set off the nonrestrictive phrase “regardless of latitude” in the middle of the sentence.

Choices A, B, and D are incorrect because none contains a pair of commas to set off the nonrestrictive phrase.

KEY: C

DIFFICULTY: Easy

Question 15

Choice D is the best answer because the word “mortality” is clear and concise, and no ideas or words are repeated.

Choices A, B, and C are incorrect because they contain redundant words or ideas. “Continuing on” and “continue on” should not be used in the same sentence. “Keep going” and “continuing on” repeat the same idea, as do “mortality” and “death.”

KEY: D

DIFFICULTY: Hard

Question 16

Choice B is the best answer because the singular verb “provides” agrees in number with the singular noun “study.”

Choices A, C, and D are incorrect because the plural verbs “provide,” “are providing,” and “have provided” don’t agree with the singular noun “study.”

KEY: B

DIFFICULTY: Medium

Question 17

Choice B is the best answer because the phrase “four quail eggs” is plural, not possessive, and needs no apostrophe.

Choices A and C are incorrect because no apostrophe is needed in the plural “eggs.” Choice D is incorrect because “quail” should not be plural.

KEY: B

DIFFICULTY: Medium

Question 18

Choice A is the best answer because sentence 5 (the scientists returning to count the eggs “many times over nine days”) logically joins sentence 4 (how many eggs were used to bait the nests at the beginning of the nine-day period) with sentence 6 (how many eggs were required to consider a nest to have survived at the end of the nine-day period).

KEY: A

DIFFICULTY: Medium

Choices B, C, and D are incorrect because moving sentence 5 would result in a paragraph that doesn't make sense logically or chronologically.

Question 19

Choice B is the best answer because it doesn't contain a conjunctive adverb or transitional phrase, neither of which is needed here.

Choices A, C, and D are incorrect because they contain conjunctive adverbs or transitional phrases that are not needed in the middle of this sentence.

KEY: B

DIFFICULTY: Medium

Question 20

Choice C is the best answer because the figure indicates that the percent of surviving nests decreased over time at each of the four locations (all four lines show a decrease over the nine-day period).

Choices A, B, and D are incorrect because they do not correctly represent the information conveyed in the figure. The figure does not indicate that the number of predators invading the nests either increased or decreased, nor does it indicate that the percent of surviving nests increased.

KEY: C

DIFFICULTY: Medium

Question 21

Choice A is the best answer because it accurately describes the data represented in the figure. The percent of surviving nests was greater at higher latitudes (for example, 82 degrees North) than at lower latitudes (for example, 63 degrees North).

Choices B, C, and D are incorrect because the figure does not indicate that the percent of surviving nests at locations having higher latitudes was smaller or remained the same, or that the percent of eggs was lower.

KEY: A

DIFFICULTY: Easy

Question 22

Choice A is the best answer because it most clearly and concisely combines the underlined sentences to indicate the relationship between the risks to the shorebirds and rewards for their offspring.

Choices B, C, and D are incorrect because they are wordy or combine ideas in a way that is not logical. Additionally, none indicates the risk-reward relationship as clearly as choice A does.

KEY: A

DIFFICULTY: Easy

Question 23

Choice C is the best answer because in this context "adhere to" means to follow or to stick to, which is the right connotation when referring to a musical score.

KEY: C

DIFFICULTY: Hard

Choices A, B, and D are incorrect because they offer options that do not work connotatively when substituted into the sentence.

Question 24

Choice D is the best answer because it creates a complete sentence by attaching the dependent clause (“As . . . improvisations”) to the independent clause (“they . . . own”) with a comma.

Choices A and C are incorrect because a period or a semicolon cannot be used to end a dependent clause. Choice B is incorrect because a comma is needed between an introductory dependent clause and the independent clause that follows it.

KEY: D

DIFFICULTY: Medium

Question 25

Choice C is the best answer because the correlative conjunctions “not only” and “but also” must be followed by parallel phrases. Since “by saxophonist Coleman Hawkins” follows “but also,” “by Armstrong” needs to follow “not only.”

Choices A, B, and D are incorrect because none contains the preposition “by,” which is needed to be consistent with the same preposition used later in the sentence.

KEY: C

DIFFICULTY: Medium

Question 26

Choice A is the best answer. The sentence should be added to provide a transition from the idea that Armstrong played solos in recordings to the idea that he played them in dance halls as well.

Choice B is incorrect because the sentence doesn’t explain why Armstrong was skilled at improvisation. Choices C and D are incorrect because the sentence should be added to provide a transition between two ideas in the paragraph.

KEY: A

DIFFICULTY: Medium

Question 27

Choice A is the best answer because it makes a connection to the main topic of the previous paragraph, the band’s solos.

Choices B, C, and D are incorrect because they do not refer to the band’s solos, which is the main topic of the previous paragraph.

KEY: A

DIFFICULTY: Medium

Question 28

Choice B is the best answer because the suggested revision provides an explanation of what a “call-and-response structure” is.

Choice A is incorrect because, while Armstrong was a trumpeter and the suggested revision does mention the trumpet section, this is not the main reason to make the revision. Choices C and D are incorrect because the sentence should be revised as suggested.

KEY: B

DIFFICULTY: Medium

Question 29

Choice D is the best answer because it clearly and concisely identifies what Redman did to accommodate Armstrong’s style.

Choices A, B, and C are incorrect because they are redundant. The verbs “adjust,” “alter,” “change,” and “rework” have essentially the same meaning and should not be used together.

KEY: D

DIFFICULTY: Hard

Question 30

Choice C is the best answer because no punctuation is needed before the quotation.

Choices A, B, and D are incorrect because they all include unnecessary punctuation.

KEY: C

DIFFICULTY: Hard

Question 31

Choice D is the best answer because only “however” indicates the contrast between the information in the previous sentence and the information in this sentence. The previous sentence states that in 1925 Armstrong left Henderson’s band, while this sentence says that though he had left, his influence continued to be noticeable in the band’s music.

Choices A, B, and C are incorrect because they do not indicate a contrast between the first two sentences in the paragraph.

KEY: D

DIFFICULTY: Medium

Question 32

Choice B is the best answer because it is idiomatic. When one situation changes to another, it can be said that the situation “gives way” to another.

Choices A, C, and D are incorrect because they are not idiomatic and do not make sense when substituted into the sentence.

KEY: B

DIFFICULTY: Medium

Question 33

Choice D is the best answer because the pronoun “that” is used correctly to refer to “arrangements.” A comma isn’t used in this context because the clause following the main clause is needed to complete the meaning of the sentence.

Choices A, B, and C are incorrect because each uses a comma inappropriately. Because the clause that follows “arrangements” is essential to the formation of the sentence, no comma should be used.

KEY: D

DIFFICULTY: Hard

Question 34

Choice D is the best answer because sentence 6 refers to commonplace “stories” about young artists being able to survive in big cities, and sentence 3 explains that “these tales” may have been true to some degree. Sentence 3 should be placed after sentence 6.

Choices A, B, and C are incorrect because “these tales” in sentence 3 must refer to something that has been discussed previously. No stories or tales are mentioned in sentences 1, 2, or 4.

KEY: D

DIFFICULTY: Medium

Question 35

Choice D is the best answer because the pronoun “you,” which refers in this context to people in general, is consistent with the other pronoun, “your,” in the sentence (“time to practice your art”).

Choices A, B, and C are incorrect because the pronoun “one” and the nouns “artist” and “artists” are not consistent in person with the pronoun “your.”

KEY: D

DIFFICULTY: Hard

Question 36

Choice B is the best answer because “however” indicates the appropriate relationship between the claim in the previous sentence (artists could once get by in a big city) and the claim in this sentence (“this life is no longer possible”). It signals the contrast between the past and present.

Choices A, C, and D are incorrect because the claim in this sentence is not a result or an example of the claim in the previous sentence.

KEY: B

DIFFICULTY: Medium

Question 37

Choice C is the best answer because “such as” indicates that examples will follow, and “upscale venues” completes the contrast with “affordable theaters, jazz cafes, and art galleries.”

Choices A, B, and D are incorrect. In choice A, “other places” is vague and doesn’t emphasize the contrast between the old and new businesses. Choice B mischaracterizes the examples as places “where artists are unlikely to spend money.” The contrast in this sentence is not between places where artists spend money and places where they don’t; rather, it is between places where artists have opportunities to perform or display their art (“affordable theaters, jazz cafes, and art galleries”) and places that do not accommodate “the artist just starting out” (“expensive restaurants, couture boutiques, and exclusive nightclubs”). Choice D is incorrect because “attractive” does not complete the contrast with “affordable.”

KEY: C

DIFFICULTY: Medium

Question 38

Choice A is the best answer because “so far as,” meaning “to the extent or degree,” is idiomatic in this context.

Choices B, C, and D are incorrect because the resulting phrases (“go too far to declare,” “go farther to declare,” “go to declare”) are unidiomatic in this context.

KEY: A

DIFFICULTY: Medium

Question 39

Choice C is the best answer because the dash is appropriate in this sentence. In this case, it draws attention to the idea that Cleveland, unlike cities that are too expensive, is a great place for young artists.

Choices A, B, and D are incorrect because the semicolon, colon, and single parenthesis are all used inappropriately in this sentence. In choice A, the semicolon links an independent clause to a dependent clause. In choice B, the colon is unnecessary and should be deleted. In choice D, the single parenthesis must be paired with another parenthesis after “artists.”

KEY: C

DIFFICULTY: Hard

Question 40

Choice D is the best answer because it is clear and doesn’t repeat information already provided in the sentence.

Choices A, B, and C are incorrect because they either repeat information or add unnecessary words.

KEY: D

DIFFICULTY: Hard

Question 41

Choice D is the best answer because the plural pronoun “those” agrees with its antecedent “prices,” and two similar things are being compared: the prices of homes and the prices of cars.

Choice A is incorrect because it compares the prices of homes to “an economy car” rather than to other prices. Choice B is incorrect because the pronoun and noun, “that” and “car,” need to be plural to be consistent with “prices” or “homes.” Choice C is incorrect because the singular possessive “car’s” doesn’t make sense in the comparison. In this context, the phrase “an economy car’s” would be understood to refer to a price, but “price” does not appear as an antecedent in the sentence. The comparison should be to “prices.”

KEY: D

DIFFICULTY: Hard

Question 42

Choice A is the best answer because the singular possessive pronoun “its” agrees in number with the antecedent “Cleveland.”

Choices B and C are incorrect because they are contractions, not possessive pronouns. Choice D is incorrect because it is a plural

KEY: A

DIFFICULTY: Hard

possessive pronoun. The correct answer needs to be singular to agree with the singular antecedent “Cleveland.”

Question 43

Choice C is the best answer because the sentence should not be added. It contains an irrelevant detail that doesn’t support previous statements.

Choices A and B are incorrect because the sentence is irrelevant and shouldn’t be added. Choice D is incorrect because the sentence would not be relevant in the final paragraph either.

Question 44

Choice B is the best answer because “discount” in this context means “disregard.”

Choice A is incorrect because “undermine” means “weaken or impair,” which does not make sense in the context of the sentence. Choices C and D are incorrect because their tone is too colloquial and inconsistent with the tone of the passage.

KEY: C

DIFFICULTY: Easy

KEY: B

DIFFICULTY: Hard

Math Test – No Calculator Answer Explanations

Question 1

Choice D is correct. The expression $15x + 24ax$ contains two terms with common factors. One of the common factors is x . Factoring x from the expression gives $x(15 + 24a)$, which can also be written as $(15 + 24a)x$.

Choices A, B, and C are incorrect and may result from incorrectly combining and/or factoring the two terms of the expression. One can check that the expressions in each of these choices are not equivalent to the given expression. For example, in choice A, for $x = 1$ and $a = 0$, the value of the given expression is 15 and the value of the expression $39ax^2$ is 0.

KEY: D

DIFFICULTY: Medium

No Calculator

Question 2

Choice A is correct. Dividing each side of the equation $d = rt$ by t results in an equation that expresses r in terms of the other variables: $r = \frac{d}{t}$.

Choices B, C, and D are incorrect and may result from algebraic errors when rewriting the given equation.

KEY: A

DIFFICULTY: Easy

No Calculator

Question 3

Choice B is correct. The equation $x = y - 4$ can be rewritten as $y = x + 4$. Substituting $x + 4$ for y in the other equation gives $x + 4 = x^2 + 3x - 4$, which can be rewritten as $x^2 + 2x - 8 = 0$. Since -4 and 2 are the two numbers whose sum is -2 and whose product is -8 , they are the solutions to the equation $x^2 + 2x - 8 = 0$. From the equation $y = x + 4$, it follows that the solutions of the system are $(-4, 0)$ and $(2, 6)$. Therefore, of the given choices, $(2, 6)$ is the correct answer.

Choices A and C are incorrect because each of these ordered pairs satisfies the quadratic equation but not the linear equation. Choice D is incorrect because this ordered pair satisfies the linear equation but not the quadratic equation.

KEY: B

DIFFICULTY: Medium

No Calculator

Question 4

Choice C is correct. The given equation can be rewritten as $x^2 - 4x + 3 = 0$. Since 1 and 3 are two numbers whose sum is 4 and whose product is 3 , it follows that they are the solutions to the equation $x^2 - 4x + 3 = 0$. Therefore, of the choices given, only 3 can be a solution to the original equation.

KEY: C

DIFFICULTY: Medium

No Calculator

Choices A, B, and D are incorrect because none of these values satisfy the given equation.

Question 5

Choice C is correct. Multiplying each side of the second equation by 3 and then adding the equations eliminates x , as follows:

$$\begin{cases} -3x - 4y = 20 \\ 3x - 30y = 48 \\ \hline 0 - 34y = 68 \end{cases}$$

Solving the obtained equation for y gives $y = -2$.

Substituting -2 for y in the second equation of the system gives $x - 10(-2) = 16$, which simplifies to $x + 20 = 16$, or $x = -4$.

Choices A, B, and D are incorrect because there is no solution to the system for which the x -coordinate is one of the numbers given in these choices. For example, substituting -14 for x in the second equation gives $y = -3$. But the pair $(-14, -3)$ does not satisfy the first equation, and it is therefore not a solution to the system of equations.

Question 6

Choice B is correct. If the equation $y = 36 + 18x$ is graphed in the xy -plane, the y -intercept is at $(0, 36)$. Since y represents the height, in inches, of a typical apple tree and x represents the number of years after it was planted, it follows that the number 36 represents the height, in inches, of a typical apple tree when $x = 0$; that is, the height, in inches, at the time the apple tree is planted.

Choice A is incorrect and may be the result of confusing the age of the tree with its height. Choice C is incorrect because the equation provided does not indicate when a typical apple tree will stop growing. Choice D is incorrect and may be the result of confusing the y -intercept with the slope of the line $y = 36 + 18x$.

Question 7

Choice A is correct. The cost, in dollars, of Giovanni's 2 shirts is $19.40 \times 2 = 38.80$, and the cost, in dollars, of his p sweaters is $24.80 \times p = 24.80p$. Additionally, he paid an 8% sales tax. To include the sales tax in the total cost, the combined cost of shirts and sweaters should be multiplied by 1.08. Therefore, the total cost, in dollars, of Giovanni's purchases, y , can be expressed as $1.08(38.80 + 24.80p)$.

Choice B is incorrect and may result from using the factor $1 - 0.08 = 0.92$, instead of $1 + 0.08 = 1.08$, to calculate the sales

KEY: C

DIFFICULTY: Medium

No Calculator

KEY: B

DIFFICULTY: Medium

No Calculator

KEY: A

DIFFICULTY: Medium

No Calculator

tax and from multiplying by this factor on the wrong side of the equation. Choice C is incorrect and may result from multiplying by the sales tax factor on the wrong side of the equation. Choice D is incorrect and may result from using the factor $1 - 0.08 = 0.92$ instead of $1 + 0.08 = 1.08$ to calculate the sales tax.

Question 8

Choice B is correct. Any line that passes through the point $(-3, 3)$ and has a positive slope will intersect the y -axis at a point $(0, b)$ with $b > 3$; that is, such a line will have a y -intercept greater than 3. Therefore, a line that has a positive slope and a negative y -intercept cannot pass through the point $(-3, 3)$.

Choices A, C, and D are incorrect because they are points that a line with a positive slope and a negative y -intercept could pass through. For example, in choice A, the line with equation $y = \frac{1}{3}x - 2$ has a positive slope $\left(\frac{1}{3}\right)$ and a negative y -intercept (-2) but passes through the point $(-3, -3)$.

Question 9

Choice C is correct. If the length, in centimeters, of one piece of rope is represented by q , and each piece of rope must be at least 270 centimeters and no more than 280 centimeters long, then it follows that $270 \leq q \leq 280$. In turn, the total length x , in centimeters, of rope needed for the parachute is $18q$ because 18 pieces are needed. So, since $x = 18q$, multiplying all the terms of the inequality $270 \leq q \leq 280$ by 18 gives $(270 \times 18) \leq 18q \leq (280 \times 18)$, or $4,860 \leq x \leq 5,040$.

Choice A is incorrect and may result from mistakenly using x for the length, in centimeters, of one piece of rope instead of the total length of rope. Choice B is incorrect and may result from multiplying the single-piece lower limit for length by 18 and then adding 10 to create the total upper limit, instead of multiplying both the single-piece lower and upper limits by 18. Choice D is incorrect and may result from multiplying the single-piece upper limit for length by 18 and then subtracting 10 to create the total lower limit, instead of multiplying both the single-piece lower and upper limits by 18.

Question 10

Choice D is correct. Since the carpenter needs to buy both nails and screws, at least one box of each needs to be purchased. This can be expressed by the pair of inequalities $n \geq 1$ and $s \geq 1$. However, the number of boxes the carpenter can buy is limited by a budget of \$60. The amount, in dollars, the carpenter spends on nails or screws can

KEY: B

DIFFICULTY: Medium

No Calculator

KEY: C

DIFFICULTY: Medium

No Calculator

KEY: D

DIFFICULTY: Medium

No Calculator

be expressed as the price of each box multiplied by the number of each type of box, which is $12.99n$ for nails and $14.99s$ for screws. And since this total cannot exceed \$60, it follows that $12.99n + 14.99s \leq 60$.

Choice A is incorrect because the first inequality allows the total cost of nails and screws to exceed the carpenter's budget of \$60, and the second inequality incorrectly expresses the constraint on the number of boxes that the carpenter can buy. That number must be greater than 1, since the carpenter must buy at least one box of nails and one box of screws. Choice B is incorrect because the second equation incorrectly expresses the constraint on the number of boxes that the carpenter can buy. That number must be greater than 1, since the carpenter must buy at least one box of nails and one box of screws. Choice C is incorrect because the first inequality allows for the total cost to exceed the carpenter's budget of \$60.

Question 11

Choice A is correct. In the figure, triangles ABC and BDC are similar because each has an angle that measures 28° , and they share angle C . Thus their corresponding sides are in proportion. The sides AB in triangle ABC and BD in triangle BDC correspond to each other because they are opposite the same angle in both triangles (angle C), and the sides BC in triangle ABC and DC in triangle BDC correspond to each other because they are opposite the congruent angles with measure 28° in the corresponding triangles. Therefore, $\frac{AB}{BC} = \frac{BD}{DC}$.

Choices B, C, and D are incorrect because they are ratios that do not have the same value as $\frac{AB}{BC}$ and are likely the result of misunderstanding which triangles are similar or which sides of the triangles are corresponding sides.

KEY: A

DIFFICULTY: Hard

No Calculator

Question 12

Choice C is correct. After distributing the outside exponents to each expression within the parentheses by the rules of exponents, the left side of the equation can be rewritten as

$$\left(x^2 y^3\right)^{\frac{1}{2}} \left(x^2 y^3\right)^{\frac{1}{3}} = \left(x^{(2)\left(\frac{1}{2}\right)} y^{(3)\left(\frac{1}{2}\right)}\right) \left(x^{(2)\left(\frac{1}{3}\right)} y^{(3)\left(\frac{1}{3}\right)}\right) = \left(xy^{\frac{3}{2}}\right) \left(x^{\frac{2}{3}} y\right).$$

Multiplying the expressions within the parentheses and applying the exponent rules yields $x^{1+\frac{2}{3}} y^{\frac{3}{2}+1} = x^{\frac{5}{3}} y^{\frac{5}{2}}$, which means the equation $x^{\frac{5}{3}} y^{\frac{5}{2}} = x^{\frac{a}{3}} y^{\frac{a}{2}}$ is true for all positive values of x and y . It

KEY: C

DIFFICULTY: Hard

No Calculator

follows that the corresponding exponents of x and y on both sides of the equation must be equal, which yields $a = 5$.

Choices A, B, and D are incorrect and may result from errors when applying the rules of exponents to the given expression.

Question 13

Choice B is correct. The graph of $y = (x - 6)(x + 12)$ is a parabola that opens upward and has a vertical axis of symmetry. The vertex of the parabola lies on this axis of symmetry, and the x -intercepts of the parabola are equidistant from the axis of symmetry. Since the equation $y = (x - 6)(x + 12)$ is in factored form, the x -intercepts of its graph are $(6, 0)$ and $(-12, 0)$. Therefore, the axis of symmetry is the line $x = \frac{6 + (-12)}{2}$, or $x = -3$. Because the vertex lies on the line $x = -3$, the x -coordinate of the vertex must also be $x = -3$.

Choices A, C, and D are incorrect and may result from misunderstanding the relationship between the given equation and the x -intercepts of the parabola as well as the relationship between the x -intercepts of the parabola and the x -coordinate of the parabola's vertex. For example, choice C may result from mistakenly taking the x -intercepts of the graph of $y = (x - 6)(x + 12)$ as $(-6, 0)$ and $(12, 0)$ instead of as $(6, 0)$ and $(-12, 0)$.

Question 14

The correct answer is 2. If a linear equation is written in the form $mx + n = px + r$, where $m = p$ and $n = r$, then the linear equation is satisfied by *any* value of x and will have infinitely many solutions. Distributing 7 on the right-hand side of the given equation yields $21x + 14 = 21x + 7a$. Therefore, the equation will have infinitely many solutions if $14 = 7a$; that is, if $a = 2$.

Question 15

The correct answer is 90. Juliene practiced twice as long on Monday as she did on Tuesday. Therefore, if x is the number of minutes Juliene practiced on Tuesday, then $2x$ is the number of minutes she practiced on Monday. The total amount of time Juliene practiced on the two days is 2 hours and 15 minutes, which is equal to 135 minutes. Thus, the equation $x + 2x = 135$ must be true. This simplifies to $3x = 135$, and so $x = 45$. The number of minutes Juliene practiced on Monday is $2x$, which is equal to $2x = 2(45) = 90$.

KEY: B

DIFFICULTY: Hard

No Calculator

KEY: 2

DIFFICULTY: Medium

No Calculator

KEY: 90

DIFFICULTY: Hard

No Calculator

Question 16

The correct answer is 1. It is given that one factor of the quadratic expression is $3x + 4$. Thus, $12x^2 + ax - 20 = (3x + 4)(mx + p)$, where a , m , and p are integers. Multiplying out the right-hand side of the equation gives $12x^2 + ax - 20 = 3mx^2 + (3p + 4m)x + 4p$. It follows that $12 = 3m$, $a = 3p + 4m$, and $-20 = 4p$. Dividing both sides of the equation $12 = 3m$ by 3 gives $m = 4$. Dividing both sides of the equation $-20 = 4p$ by 4 gives $p = -5$. Finally, substituting $m = 4$ and $p = -5$ in the equation $a = 3p + 4m$ gives $a = 3(-5) + 4(4) = 1$.

KEY: 1

DIFFICULTY: Hard

No Calculator

Question 17

The correct answer is 0. Multiplying out the given expression yields $(ax + by)(cx - dy) = acx^2 + (bc - ad)xy - bdy^2$. Since $ad = bc$, the coefficient of the xy term, $bc - ad$, is 0.

KEY: 0

DIFFICULTY: Hard

No Calculator

Math Test – Calculator Answer Explanations

Question 1

Choice B is correct. Looking at the graph, it can be concluded that there is an increase of fewer than 10 students during quarters 4 through 6, quarters 11 through 14, and quarters 13 through 16. There is an increase of more than 20 students during quarters 7 through 10. Therefore, of the four ranges given in the answer choices, the greatest increase in the number of students occurs during quarters 7 through 10.

Choices A, C, and D are incorrect. There is an increase of fewer than 10 students during quarters 4 through 6, quarters 11 through 14, and quarters 13 through 16. There is an increase of more than 20 students during quarters 7 through 10. Therefore, the greatest increase in the number of students does not occur in the ranges given in choices A, C, and D.

KEY: B

DIFFICULTY: Easy

Calculator

Question 2

Choice A is correct. The time at which Eli began saving corresponds to $m = 0$. Therefore, the value of T when $m = 0$ represents the amount of money Eli started with. Substituting 0 for m gives $T = 83 + 30(0)$, or $T = 83$. Therefore, the amount of money Eli started with is 83 units of money. (Note: The item does not specify a unit of money, such as dollars; however, this does not change the interpretation of the number 83 in the equation.)

Choice B is incorrect because the number of months Eli has been saving corresponds to the value of m . Choice C is incorrect because the amount of money Eli saves each month is 30 units of money. Choice D is incorrect because the amount of money Eli wants to save is not provided in the problem.

KEY: A

DIFFICULTY: Easy

Calculator

Question 3

Choice B is correct. Since 0.15 milligrams (mg) of zinc is provided

by 100 grams (g) of banana, the number of mg of zinc provided

by 140 g of banana can be found by solving for x in the proportion

$$\frac{0.15 \text{ mg}}{100 \text{ g}} = \frac{x}{140 \text{ g}}$$

Cross multiplying gives $100x = 140(0.15)$, or

$$x = 0.21 \text{ mg.}$$

Choice A is incorrect because 0.15 milligrams is the amount of zinc in 100 grams of banana, not in 140 grams. Choices C and D are incorrect and likely the result of calculation errors.

KEY: B

DIFFICULTY: Easy

Calculator

Question 4

Choice D is correct. In the xy -plane, the point $(-2, 1)$ is the point where $x = -2$ and $y = 1$. Because $(-2, 1)$ is on the line, we can substitute $x = -2$ and $y = 1$ into the equation for the line. This substitution yields $1 = 5(-2) + p$, or $1 = -10 + p$. Solving this equation for p gives $p = 11$.

Choice A is incorrect and likely arises by subtracting 10 from both sides of the equation $1 = 5(-2) + p$ rather than by adding 10. Choice B is incorrect and likely arises from mistakenly equating the value of p with the x -coordinate of the given point. Choice C is incorrect and likely the result of calculation errors.

KEY: D

DIFFICULTY: Medium

Calculator

Question 5

Choice B is correct. The line of best fit shown for the data has a positive slope. It can be concluded from this that higher values for the number of times at bat correspond to higher values for the number of hits. Therefore, as the number of times at bat increases, the number of hits increases.

Choice A is incorrect because the number of hits increases, not decreases, as the number of times at bat increases. Choice C is incorrect because the number of hits increases as the number of times at bat increases. Choice D is incorrect because as the number of times at bat decreases, the number of hits decreases, not increases.

KEY: B

DIFFICULTY: Easy

Calculator

Question 6

Choice A is correct. According to the scatterplot, the player with 450 times at bat had approximately 113 hits (the y -coordinate of the point representing this player is approximately halfway between 100 and 125). The line of best fit predicts approximately 123 hits. Therefore, the actual number of hits made by this player is approximately 10 fewer than the number of hits predicted by the line of best fit.

Choices B, C, and D are incorrect because each gives a value much greater than 10, which is the best approximation of how many fewer hits were made by the player with 450 times at bat than predicted by the line of best fit.

KEY: A

DIFFICULTY: Medium

Calculator

Question 7

Choice B is correct. Since the printer can print 400 characters per second and there are 60 seconds in each minute, the printer can print 400×60 , or 24,000, characters per minute. Using the convention of 5 characters per word, the printer can print $\frac{24,000}{5}$, or 4,800, words per minute.

KEY: B

DIFFICULTY: Medium

Calculator

Choice A is incorrect; it is the result of multiplying 400 characters per second by 5 characters per word. Choice C is incorrect because it is the number of characters that can be printed each minute, not the number of 5-character words that can be printed each minute. Choice D is the result of multiplying, rather than dividing, the 24,000 characters the printer can print each minute by 5 characters per word.

Question 8

Choice C is correct. From Year 0 to Year 1, the salary increases by \$1,140; from Year 1 to Year 2, the salary increases by \$1,174; from Year 2 to Year 3, the salary increases by \$1,210; and from Year 3 to Year 4, the salary increases by \$1,245. Because the dollar amount of the salary increases each year at a nonconstant rate, a linear model will not be a good fit to the data. However, the ratio of the salary in a certain year to the salary in the preceding year remains about the same from one year to the next. For example, the ratio of the salary in Year 1 to the salary in Year 0 is $\frac{39,140}{38,000}$, and the ratio of the salary in Year 2 to the salary in Year 1 is $\frac{40,314}{39,140}$. Both these ratios are approximately 1.03, which corresponds to a 3% increase each year. Therefore, an exponential model increasing by approximately 3% each year would describe the data better than the models in the other choices.

Choices A and B are incorrect because they suggest a linear model is most appropriate; in a linear model, the dollar amount of the salary increase would be approximately the same from one year to the next. In this example, the dollar amount of the salary increase is increasing each year, so a linear model wouldn't fit the data well.

Choice D is incorrect because the ratio of the salary in a certain year to the salary in the preceding year (for example, $\frac{40,314}{39,140}$ and $\frac{39,140}{38,000}$) is approximately 1.03, which corresponds to a 3% increase each year, not a 9% increase each year.

KEY: C

DIFFICULTY: Medium

Calculator

Question 9

Choice A is correct. Distributing the factor of -1 through the second expression in parentheses in $(x^2y - 3y^2 + 5xy^2) - (-x^2y + 3xy^2 - 3y^2)$ yields $x^2y - 3y^2 + 5xy^2 + x^2y - 3xy^2 + 3y^2$. Regrouping by like terms, the expression becomes $(x^2y + x^2y) + (-3y^2 + 3y^2) + (5xy^2 - 3xy^2)$, which simplifies to $2x^2y + 2xy^2$.

Choice B is incorrect; it is the result of adding, rather than subtracting, the given expressions $(x^2y - 3y^2 + 5xy^2)$ and $(-x^2y + 3xy^2 - 3y^2)$. **Choice C** is incorrect; it is the result of subtracting only the first term in the second expression from the first expression and adding the other terms in the second expression to the first expression. **Choice D** is incorrect; it is the result of attempting to multiply the first, second, and third terms in each of the two expressions rather than subtracting.

Question 10

Choice D is correct. The equation $4x - \frac{1}{2}x - 7 = 7\left(\frac{1}{2}x - 7\right)$ can be rewritten as $\frac{7}{2}x - 7 = \frac{7}{2}x - 49$, which results in the equation $7 = 49$. Because 7 is not equal to 49 , there is no value of x that makes the equation true. Therefore, there are no solutions to this equation.

Choice A is incorrect. It may be the result of substituting 0 for x in the given equation and incorrectly applying the distributive property on the right side of the equation, yielding $-7 = -7$. **Choice B** is incorrect and likely results from errors made when simplifying the left- and right-hand sides of the equation when solving for x .

Choice C is incorrect and may result from incorrectly distributing the 7 on the right-hand side of the equation to obtain $\frac{7}{2}x - 7 = \frac{7}{2}x - 7$; this equation has infinitely many solutions.

Question 11

Choice D is correct. The range of Joseph's bills is $\$193.12 - \$145.30 = \$47.82$, which is greater than the range of Samuel's bills, which is $\$188.99 - \$149.23 = \$39.76$. The median of Joseph's bills is $\$180.33$, which is less than the median of Samuel's bills, $\$181.27$.

KEY: A

DIFFICULTY: Medium

Calculator

KEY: D

DIFFICULTY: Medium

Calculator

KEY: D

DIFFICULTY: Medium

Calculator

Choices A, B, and C are incorrect. The range of Joseph's bills is greater than the range of Samuel's bills, and the median of Joseph's bills is less than the median of Samuel's bills. Each of choices A, B, and C gets at least one of these facts wrong.

Question 12

Choice A is correct. According to the table, there are 16 double-decker train cars that have been in service for less than 10 years. Since there are 810 train cars in service on the railroad, the portion of the train cars that are double-decker train cars that have been in service for less than 10 years is $\frac{16}{810} \approx 0.0198$. This corresponds to 1.98%, or about 2%.

Choice B is incorrect and may be the result of dividing 16 by 215, which gives the ratio of the number of double-decker train cars that have been in service less than 10 years to the number of single-level train cars that have been in service less than 10 years, and then multiplying by 100. Choice C is incorrect and may be the result of using the number of double-decker train cars that have been in service for more than 10 years, 82, rather than using the number of double-decker train cars that have been in service for less than 10 years, 16. Choice D is incorrect and may be the result of identifying that there are 16 double-decker cars that have been in service for less than 10 years and assuming that the answer is 16%, rather than dividing 16 by the total number of train cars in service to find the actual percentage.

Question 13

Choice B is correct. There are 12 inches in one foot, so the 900 inches of plastic wrap used for each group of boxes is equal to $\frac{900}{12} = 75$ feet. The total number of groups of boxes that can be bundled with 1,500 feet of plastic wrap can be found by dividing the total number of feet of plastic wrap, 1,500, by the number of feet of plastic wrap needed for each group, 75. Therefore, $\frac{1,500}{75} = 20$ groups of boxes can be bundled with 1,500 feet of plastic wrap.

Choice A is incorrect because more than 15 groups of boxes can be bundled with 1,500 feet of plastic wrap. If 900 inches of plastic wrap are needed per group, then the amount of plastic wrap needed to bundle 15 groups is 1,125 feet (900 inches \times 15 groups = 13,500 inches; 13,500 inches \div 12 inches per foot = 1,125 feet). The problem

KEY: A

DIFFICULTY: Medium

Calculator

KEY: B

DIFFICULTY: Medium

Calculator

states that there are 1,500 feet of plastic wrap available. Choices C and D are incorrect because there is not enough plastic wrap to bundle this many groups of boxes. To bundle 25 groups, 1,875 feet of plastic wrap are needed ($900 \text{ inches} \times 25 \text{ groups} = 22,500 \text{ inches}$; $22,500 \text{ inches} \div 12 \text{ inches per foot} = 1,875 \text{ feet}$). To bundle 30 groups, 2,250 feet of plastic wrap are needed ($900 \text{ inches} \times 30 \text{ groups} = 27,000 \text{ inches}$; $27,000 \text{ inches} \div 12 \text{ inches per foot} = 2,250 \text{ feet}$).

Question 14

Choice C is correct. The number of calories listed in the table can be ordered from least to greatest, as follows: 700, 740, 810, 900, 1,050, and 1,120. Since the total of numbers in the list, 6, is an even number, the median is the mean of the two middle numbers, 810 and 900, which is $\frac{810 + 900}{2} = 855$. According to the table, the cheeseburger at the Riverside Diner has 1,120 calories. Therefore, the difference in the number of calories in a cheeseburger at the Riverside Diner and the median number of calories in cheeseburgers at all six restaurants is $1,120 - 855 = 265$.

Choice A is incorrect. This answer choice is the result of incorrectly finding the median by using the mean of the two middle numbers, 740 and 1,120, in the table's unsorted list of the number of calories in cheeseburgers. Choice B is incorrect. This answer choice is the approximate difference between the number of calories in a cheeseburger at the Riverside Diner and the mean (rather than the median) number of calories in the cheeseburgers at all six restaurants. Choice D is incorrect. This answer choice may be the result of assuming that the median is the third number listed in the table, finding the difference between the number of calories in a cheeseburger at the Riverside Diner and the number of calories in a cheeseburger at Molly's ($1,120 - 740 = 380$), and then selecting the closest available value, 390.

Question 15

Choice C is correct. The standard form for the equation of a circle in the xy -plane with center (h, k) and radius r is $(x - h)^2 + (y - k)^2 = r^2$. Therefore, the equation of a circle with radius 3 and center $(4, -2)$ is $(x - 4)^2 + (y + 2)^2 = 9$.

Choice A is incorrect. This equation is of a circle with center at $(-4, 2)$ and a radius of $\sqrt{3}$, not 3. Choices B and D are incorrect because these equations define ellipses rather than circles; in the standard form for an equation of a circle, the two squared terms on the left-hand side of the equation are added, not subtracted.

KEY: C

DIFFICULTY: Medium

Calculator

KEY: C

DIFFICULTY: Medium

Calculator

Question 16

Choice B is correct. Since the 327 9th-grade students are a random sample selected from all 9th-grade students in the school, the sample can be considered to be representative of all the 9th-grade students in the school. This means that the proportion of 9th-grade students in the school who had a GPA of 3.0 or greater can be estimated using the proportion of 9th-grade students who had a GPA of 3.0 or greater in the sample. Of the 327 9th-grade students in the study, $61 + 95 = 156$ students had a GPA of 3.0 or greater.

Therefore, the probability that a 9th-grade student at the school chosen at random had a GPA of 3.0 or greater is estimated to be $\frac{156}{327} \approx 0.477$, which rounds to 0.48.

Choice A is incorrect. This answer choice is the result of dividing the number of students in the study enrolled in Propel with a GPA of 3.0 or greater, 61, by the number of students in the study not enrolled in Propel with a GPA of 3.0 or greater, 95, rather than dividing the total number of students with a GPA of 3.0 or higher by the total number of students in the study. Choice C is incorrect. This answer choice reflects the probability that a 9th-grade student, selected at random, is enrolled in Propel. It is the result of dividing the total number of students enrolled in Propel, rather than the total number of students with a GPA of 3.0 or greater, by the total number of students in the study. Choice D is incorrect. This answer choice reflects the probability that a 9th-grade student, selected at random, is enrolled in Propel and has a GPA of 3.0 or greater. It is the result of dividing the number of students who both are enrolled in Propel and had a GPA of 3.0 or greater, rather than all students who had a GPA of 3.0 or greater, by the total number of students in the study.

Question 17

Choice D is correct. There are 61 students enrolled in Propel who had a GPA of 3.0 or greater and 48 students enrolled in Propel who had a GPA of less than 3.0, so there are a total of $61 + 48 = 109$ students enrolled in Propel. The percentage of students enrolled in Propel who had a GPA of 3.0 or greater is $\frac{61}{109} \times 100\% \approx 55.96\%$, or about 56%. There are 95 students who are not enrolled in Propel who had a GPA of 3.0 or greater and 123 students not enrolled in

KEY: B

DIFFICULTY: Medium

Calculator

KEY: D

DIFFICULTY: Hard

Calculator

Propel who had a GPA of less than 3.0, so there are a total of $95 + 123 = 218$ students who are not enrolled in Propel. The percentage of students not enrolled in Propel who had a GPA of 3.0 or greater is $\frac{95}{218} \times 100\% \approx 43.58\%$, or about 44%. Therefore, the difference, to the nearest whole percent, between the percentage of students enrolled in Propel who had a GPA of 3.0 or greater and the percentage of students not enrolled in Propel who had a GPA of 3.0 or greater is $56\% - 44\% = 12\%$.

Choice A is incorrect. This answer choice is the result of finding the difference between the percentage of students in the study who both are enrolled in Propel and had a GPA of 3.0 or greater ($61 \div 327 \times 100\% \approx 18.7\%$) and the percentage of students in the study who both are enrolled in Propel and had a GPA less than 3.0 ($48 \div 327 \times 100\% \approx 14.7\%$). Choice B is incorrect. This answer choice is the result of finding the difference between the percentage of students in the study who both are not enrolled in Propel and had a GPA of 3.0 or greater. Choice C is incorrect. This answer choice may be the result of subtracting the number of students enrolled in Propel who had a GPA of 3.0 or greater from the number of students not enrolled in Propel who had a GPA of 3.0 or greater ($95 - 61 = 34$), then dividing the result by the total number of students in the study.

Question 18

Choice B is correct. There are a total of 109 students enrolled in Propel (61 with a GPA of 3.0 or greater and 48 with a GPA of less than 3.0). If the ratio of boys to girls in Propel is 2:3, for every group of 5 students enrolled in Propel, 3 are girls. Since $\frac{3}{5}$ of 109 is about 65.4, the best estimate of the number of girls enrolled in Propel is 65.

Choice A is incorrect; it is the best estimate for the number of boys enrolled in Propel. Choice C is incorrect; it is the result of multiplying the total number of students in Propel, 109, by $\frac{2}{3}$ rather than first using the ratio of the number of boys to the number of girls to find the percentage of students in Propel who are girls. Choice D is incorrect. There are only 109 students enrolled in Propel, so there cannot be 131 girls enrolled in Propel.

KEY: B

DIFFICULTY: Hard

Calculator

Question 19

Choice C is correct. Let S be the length, in inches, of each of the 4 sides of the square sculpture, and let T be the length, in inches, of each of the 3 sides of the equilateral triangle sculpture. Since the rod used to make the square sculpture is the same length as the rod used to make the triangle sculpture, $4S = 3T$. The fact that each side of the triangle, T , is 2 inches longer than each side of the square, S , can be expressed by the equation $T = S + 2$. Substituting $S + 2$ for T in the equation $4S = 3T$ gives $4S = 3(S + 2)$. This equation simplifies to $4S = 3S + 6$, so $S = 6$ and $T = 8$. Therefore, the length, in inches, of each rod is $4(6) = 3(8) = 24$.

Choice A is incorrect. If the length of each rod were 16 inches, the length of each side of the square would be $16 \div 4 = 4$ inches, and the length of each side of the triangle would be $16 \div 3 \approx 5.3$ inches. In this case, each side of the triangle is about 1.3 inches longer than each side of the square, but the question states that each side of the triangle is 2 inches longer than each side of the square. **Choice B** is incorrect. It is the result of correctly solving the system of equations to find that $S = 6$ but incorrectly assuming that the length, in inches, of the rod is equal to $3S$, not $4S$. **Choice D** is incorrect. If the length of each rod were 30 inches, the length of each side of the square would be $30 \div 4 = 7.5$ inches, and the length of each side of the triangle would be $30 \div 3 = 10$ inches. In this case, each side of the triangle is 2.5 inches longer than each side of the square, but the question states that each side of the triangle is 2 inches longer than each side of the square.

Question 20

Choice B is correct. The domain of the rational function

$f(x) = \frac{2x - 4}{2x^2 + 2x - 4}$ will be all real values of x except the values of

x for which the denominator, $2x^2 + 2x - 4$, becomes 0. Solving the

equation $2x^2 + 2x - 4 = 0$ gives $x = 1$ and $x = -2$. The equation in

choice B, $f(x) = \frac{2(x - 2)}{2(x + 2)(x - 1)}$, is equivalent to the given function,

since the numerator and denominator are just the factored forms

of $2x - 4$ and $2x^2 + 2x - 4$, respectively. Therefore, the equation

in choice B is an equivalent form of $f(x)$ that displays values not

included in the domain as constants.

Choice A is incorrect because the values of x where the denominator is equal to 0 are not displayed as constants or coefficients. **Choices C** and **D** are incorrect because neither is equivalent to

$$f(x) = \frac{2x - 4}{2x^2 + 2x - 4}.$$

KEY: C

DIFFICULTY: Medium

Calculator

KEY: B

DIFFICULTY: Hard

Calculator

Question 21

Choice B is correct. It is given that the equation $A = 4p + 64$ will relate the area A , in square feet, of the path and the perimeter p , in feet, of the fountain. This equation can be rewritten to express p in terms of A : subtracting 64 from each side of $A = 4p + 64$ gives

$A - 64 = 4p$, and dividing by 4 and simplifying gives $p = \frac{A}{4} - 16$. For each additional square foot of area, the value of A increases by 1.

Using $p = \frac{A}{4} - 16$, an increase in A by 1 results in an increase in p by $\frac{1}{4}$. Therefore, the perimeter of the fountain increases by $\frac{1}{4}$ foot for each additional square foot of the path's area.

Choices A and D are incorrect and may be the result of misinterpreting the constant term 64 in the given equation.

Choice C is incorrect; it is the number of square feet the area, A , of the path will increase for every increase in p by 1 foot rather than the number of feet the perimeter will increase for each additional square foot of area.

Question 22

Choice D is correct. Since q is a function and its graph is a parabola, it follows that q is a quadratic function and the parabola is symmetric about the vertical line through its vertex. Thus, the x -coordinate of the vertex (2, 4) is the average of the x -coordinates of the two x -intercepts $(-1, 0)$ and $(r, 0)$. That is, $2 = \frac{-1 + r}{2}$. It follows that $4 = -1 + r$, so $r = 5$.

Choices A, B, and C are incorrect and may result from confusing the roles of the x -coordinates and y -coordinates in the question.

Question 23

Choice D is correct. The temperature when chilling began was 100°C . Since the time the chilling began corresponds to the value $t = 0$, the correct equation must yield the value $C = 100$ for $t = 0$. This eliminates choices A, B, and C. The temperature decreases at a constant rate from 100°C to 25°C . So the function that represents C in terms of t must be a linear function of the form $C = 100 - at$, where a is the rate at which the temperature decreases, in degrees Celsius per second. The temperature decreases from 100°C to 25°C , or 75°C , in 5 seconds. This is a rate of decrease of 15°C per second. Thus, $a = 15$. Therefore, the linear function in choice D represents correctly the temperature C , in degrees Celsius, as a function of the time t , in seconds, after the chilling began.

KEY: B

DIFFICULTY: Hard

 Calculator

KEY: D

DIFFICULTY: Hard

 Calculator

KEY: D

DIFFICULTY: Hard

 Calculator

Choices A, B, and C are incorrect because each of these functions fails to give the correct value $C = 100$ for $t = 0$.

Question 24

Choice C is correct. Let r_E be the radius of Earth, and let r_J be the radius of Jupiter. Since the radius of Jupiter is 11 times the radius of Earth, $r_J = 11r_E$. Assuming Jupiter is a sphere, the volume of Jupiter is $\frac{4}{3}\pi r_J^3$. Substituting $11r_E$ for r_J in this expression gives $\frac{4}{3}\pi(11r_E)^3$, which can be rewritten as follows: $\frac{4}{3}\pi(11)^3(r_E)^3 = (11)^3\left[\frac{4}{3}\pi(r_E)^3\right]$. Since the expression in brackets is the volume of Earth, it follows that the volume of Jupiter is $(11)^3$, or 1,331, times larger than the volume of Earth.

Choice A is incorrect. This is the result of assuming that because the radius of Jupiter is 11 times the radius of Earth, the volume of Jupiter is 11 times the volume of Earth. If the radius of a sphere is multiplied by a factor of 11, its volume is multiplied by $11^3 = 1,331$, not 11. Choice B is incorrect. This is the result of multiplying the volume of the sphere by 11^2 rather than 11^3 . If the radius of a sphere is multiplied by a factor of 11, its volume is multiplied by $11^3 = 1,331$, not $11^2 = 121$. Choice D is incorrect. If the radius of a sphere is multiplied by a factor of 11, the volume is multiplied by a factor of $11^3 = 1,331$, not $\frac{4}{3}(11)^3 \approx 1,775$.

Question 25

Choice B is correct. Since the population of squirrels in the park has been doubling every 15 years, it means that if the current population of squirrels is A , 15 years later it will be $2A$. The increase of a function value at a rate that is proportional to the current function's value is characteristic of an exponential growth function. For this example, the squirrel population can be modeled by the function $P(t) = A \cdot 2^{\frac{t}{15}}$, where A is the population of squirrels at an initial moment in time, t is the number of years since the initial time, and $P(t)$ is the population of the squirrels t years after the initial time.

Choices A and C are incorrect because the squirrel population is increasing by the same percentage each 15-year time period, not by the same amount. Choice D is incorrect because a population that is increasing by the same percentage over each time period is experiencing exponential growth, not linear growth.

KEY: C

DIFFICULTY: Medium

Calculator

KEY: B

DIFFICULTY: Hard

Calculator

Question 26

Choice D is correct. The definition of a function describes the rule by which each input, x , is assigned a single output, $f(x)$. So $f(x - 4)$ is the output obtained when the same rule, f , is applied to a different input, $x - 4$. Therefore, to find $f(x - 4)$, take the definition $f(x) = 3x^2 - 5x + 4$ and substitute $x - 4$ for x throughout the equation to obtain $f(x - 4) = 3(x - 4)^2 - 5(x - 4) + 4$.

Now expand the right-hand side and collect like terms:

$$\begin{aligned} f(x - 4) &= 3(x - 4)^2 - 5(x - 4) + 4 \\ &= 3(x^2 - 8x + 16) - 5(x - 4) + 4 \\ &= 3x^2 - 24x + 48 - 5x + 20 + 4 \\ &= 3x^2 - 24x - 5x + 48 + 20 + 4 \\ &= 3x^2 - 29x + 72 \end{aligned}$$

Choice A is incorrect; it subtracts 4 from the right-hand side only, when to find $f(x - 4)$ in terms of x , $x - 4$ should be substituted for x throughout the equation $f(x) = 3x^2 - 5x + 4$. Choices B and C are incorrect and likely result from errors in expanding and simplifying the equation $f(x - 4) = 3(x - 4)^2 - 5(x - 4) + 4$.

Question 27

Choice D is correct. If (x_0, y_0) is the point at which the two lines intersect, the coordinates x_0 and y_0 must satisfy each of the given equations in the system of equations below:

$$\begin{aligned} x &= \frac{1}{3}y \\ 154 - 4y &= 10x \end{aligned}$$

This system can be solved by writing the second equation in terms of only x . To do so, first multiply each side of the first equation, $x = \frac{1}{3}y$, by 3, which gives $3x = y$. Substituting $3x$ for y in the second equation, $154 - 4y = 10x$, gives $154 - 12x = 10x$. Adding $12x$ to each side of $154 - 12x = 10x$ gives $154 = 22x$, so $x = 7$. Finally, substituting 7 for x in the equation $x = \frac{1}{3}y$ gives $7 = \frac{1}{3}y$, and multiplying each side of $7 = \frac{1}{3}y$ by 3 gives $21 = y$. When the two equations are graphed in the xy -plane, the resulting lines intersect at the point $(7, 21)$.

KEY: D

DIFFICULTY: Hard

 Calculator

KEY: D

DIFFICULTY: Hard

 Calculator

Choices A, B, and C are incorrect. Each of these points lies on the line with equation $x = \frac{1}{3}y$, but none of these points lies on the line with equation $154 - 4y = 10x$. For example, the point (1, 3) does not lie on the line with equation $154 - 4y = 10x$ because substituting $x = 1$ and $y = 3$ in the equation gives $154 - 4(3) = 10(1)$; this simplifies to $142 = 10$, which is not a true statement.

Question 28

The correct answer is 65. Based on the table, 10 Szechuan chicken meals contain $(5)(10) = 50$ grams of fat and $(35)(10) = 350$ grams of carbohydrates. So the greatest number of stir-fry meals that John can purchase must contain no more than $350 - 50 = 300$ grams of fat and no more than $2975 - 350 = 2625$ grams of carbohydrates. It follows that the greatest number of stir-fry meals he can purchase so that the combination will satisfy the fat requirement is $\frac{300}{4} = 75$, and the greatest number of stir-fry meals he can purchase so that the combination will satisfy the carbohydrate requirement is $\frac{2625}{40} = 65.625$. Since John cannot purchase parts of a meal and purchasing 66 stir-fry meals would exceed the carbohydrate requirement, the greatest number of meals he can purchase so that the carbohydrate requirement will be satisfied is 65. Therefore, the greatest number of stir-fry meals he can purchase so that the combination will satisfy both requirements is 65.

KEY: 65

DIFFICULTY: Hard

Calculator

Question 29

The correct answer is 0 or 12. To solve the given system of equations, one can use the second equation, $y = x - 1$, and substitute $x - 1$ for y in the first equation, giving $x - 1 = x^2 - 4x + 3$. This equation can be rewritten as $x^2 - 5x + 4 = 0$. Since 1 and 4 are the two numbers whose sum is 5 and whose product is 4, they are the solutions to the equation $x^2 - 5x + 4 = 0$. From the equation $y = x - 1$, it follows that (1, 0) and (4, 3) are the solutions to the given system of equations. Therefore, the value of the product xy can be $(1)(0) = 0$ or $(4)(3) = 12$. Either 0 or 12 can be gridded as the correct answer.

KEY: 0, 12

DIFFICULTY: Hard

Calculator

Question 30

The correct answer is 1368. According to the graph, the king crab supply in 2006 was 180 million pounds. It is given that 60% of this supply was sold at \$8 per pound and the rest of the supply was sold at \$7 per pound. It follows that $(0.6)(180) = 108$ million pounds of king crab was sold at \$8 per pound, and $180 - 108 = 72$ million pounds of king crab was sold at \$7 per pound. Therefore, the revenue generated, in millions of dollars, from the sales of king crab in 2006 was $(108)(8) + (72)(7) = 1368$.

KEY: 1368

DIFFICULTY: Hard

Calculator

Question 31

The correct answer is 85. According to the graph, the king crab supply in 2011 was 80 million pounds. So at the price of \$17 per pound, the revenue generated, in millions of dollars, from the sales of king crab in 2011 was $(80)(17) = 1360$. Since x millions pounds of king crab was sold in 2012 at the price of \$16 per pound, the revenue in 2012 was $16x$ million dollars. It is given that the revenue generated from the sales of king crab in 2011 was the same as the revenue in 2012. Therefore, $16x = 1360$, so $x = 85$.

KEY: 85

DIFFICULTY: Hard

Calculator
