

# PSAT Practice Test 2016

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# Reading Test

60 MINUTES, 47 QUESTIONS

Turn to Section 1 of your answer sheet to answer the questions in this section.

## DIRECTIONS

Each passage or pair of passages below is followed by a number of questions. After reading each passage or pair, choose the best answer to each question based on what is stated or implied in the passage or passages and in any accompanying graphics (such as a table or graph).

### Questions 1-9 are based on the following passage.

This passage is adapted from Mark Slouka, *Brewster: A Novel*.  
©2013 by Mark Slouka.

This was a time trial, he said—a one-mile time trial, four laps—not a race. It was meant to give an idea of where we stood, no more.

Line We'd gathered around the middle of the long side  
5 of the track, just ten or twelve of us, including three others who seemed new like me, jogging back and forth in the wind, loosening up. The rest had walked over to the other side of the field.

Falvo took me aside. "Warmed up? How're the  
10 shoes?"

"Fine." In the distance I could see kids walking toward the parking lot. The sun stabbed out from under the clouds, glancing off the windshields.

He raised his voice over the wind. "All right, I  
15 want you all to stay contained, stay smooth. I don't want to see anybody draining the well today—that means you, Mr. McCann." A tall, tough-looking kid with red hair and a tight face smiled like a gunslinger.

He turned to me. "I don't want you doing  
20 anything stupid, Mosher. Some of these boys have been at it for a while. Don't think about them, think about yourself."

I shrugged.

"Pace yourself. Let them do what they do. They'll  
25 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?"

"Sure," I said.

"Remember, it's a time trial. Not a race."

30 There was no starting gun. We lined up in the gusty wind, Falvo standing in the soggy infield in his dress shoes holding his clipboard like a small high table against his chest with his left hand and his stopwatch in his right and then he barked, "Runners  
35 . . . marks? Go!"

They didn't run, they flowed—the kid in the headband, the red-headed kid, and two or three others in particular—with a quiet, aggressive, sustained power that looked like nothing but felt  
40 like murder and I was with them and then halfway through the third turn they were moving away smooth as water and I could hear them talking among themselves, and I was slowing, burning, leaning back like there was a rope around my neck.  
45 "Too fast, Mosher, too fast," I heard Falvo yelling, and his ax-sharp face came out of nowhere looking almost frantic and then it was gone and there was just the sound of my breathing and the crunch of my sneakers slapping the dirt. The group, still in a tight  
50 cluster, wasn't all that far ahead of me.

By the end of the second lap I heard someone far away yelling "Stop, Mosher, that's enough," and then at some point someone else calling "Coming through—inside," and they passed me like a single  
55 mass, all business now, and I remember staggering after them, gasping, drowning, my chest, my legs, my throat filling with lead and looking up through a fog of pain just in time to see the kid with the headband, halfway down the backstretch, accelerating into a  
60 sustained, powerful sprint.

I don't know why. I can't explain it. By the end of the third lap I was barely moving, clawing at the air, oblivious to everything except the dirt unfolding endlessly in front of me. "Let him go," I heard  
 65 somebody say. They'd all finished by then, recovered, and now stood watching as I staggered past them like something shot. "C'mon . . ." I heard someone start to call out uneasily, and then, "What's his name?"  
 A small crowd, I found out later, sensing something  
 70 going on, had gathered by the fence to the parking lot. The last of the newcomers had passed me long ago.

I remember seeing him appear in front of me like I was coming up from underwater and trying to  
 75 swerve but I was barely standing and I walked right into him and he caught me as I fell, his one good arm around my back, saying over and over, "All right, easy now, easy, you're done, keep walking, walk it off," like he was gentling a horse. I threw up on the  
 80 infield grass.

"What we have here," he was saying, "is a failure to communicate. Stay within yourself, I said. Don't drain the well, I said."

"What did I get?" I couldn't seem to hold my head  
 85 up, or open my eyes—the pain kept coming in waves. "What?"

"Time. What time did I get?"

He laughed—that bitter Falvo laugh—ha!—like he'd just been vindicated. "He wants to know what  
 90 he got," he said, like there was somebody with us. "You want to know what you got? I'll tell you what you got: proof you could beat yourself senseless—something I very much doubt you needed."

1

Based on the passage, which character would most likely agree with the idea that, when trying something new, it is best not to push one's limits?

- A) Falvo
- B) McCann
- C) Mosher
- D) The person who said "Let him go"

2

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 14-17 ("All right . . . McCann")
- B) Lines 19-22 ("He turned . . . yourself")
- C) Lines 55-60 ("I remember . . . sprint")
- D) Lines 76-79 ("he caught . . . horse")

3

In the context of Falvo's instructions to the runners, the main purpose of lines 24-27 ("Pace . . . OK") is to

- A) provide useful general information to the group.
- B) emphasize and elaborate on advice given earlier.
- C) introduce a philosophy applicable to sports and life.
- D) reveal Falvo's underlying motivation.

4

In the context of the passage, “I shrugged” (line 23) and “‘Sure,’ I said” (line 28) mainly serve to show the narrator’s

- A) shyness.
- B) dismissiveness.
- C) dishonesty.
- D) hostility.

5

Based on the passage, how did the experienced runners respond to Falvo’s advice?

- A) They enthusiastically embraced it.
- B) They acted like they hadn’t heard it.
- C) They generally accepted it.
- D) They only pretended to take it seriously.

6

What does the narrator say about his motivation for performing as he did in the time trial?

- A) That he was determined to keep up with the other runners
- B) That he wanted to prove something to himself
- C) That he wished to improve on his previous time
- D) That he was unable to provide a reason for his behavior

7

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 36-39 (“They didn’t . . . power”)
- B) Line 61 (“I don’t . . . explain it”)
- C) Lines 73-76 (“I remember . . . into him”)
- D) Lines 91-94 (“I’ll . . . needed”)

8

Based on the passage, when Falvo says, “Don’t drain the well” (line 83), he most probably means

- A) don’t use up all of your energy.
- B) don’t get sick.
- C) don’t try to outdo one another.
- D) don’t quit before you’re finished.

9

As used in line 89, “vindicated” most nearly means

- A) avenged.
- B) set free.
- C) defended against.
- D) proven right.

**Questions 10-18 are based on the following passage and supplementary material.**

This passage is adapted from Moisés Naím, *The End of Power: From Boardrooms to Battlefields and Churches to States, Why Being in Charge Isn't What It Used to Be*. ©2013 by Moisés Naím.

The number of democracies in the world today is unprecedented. And remarkably, even the remaining autocratic countries are less authoritarian than  
 Line before, with electoral systems gaining strength and  
 5 people empowered by new forms of contestation that repressive rulers are poorly geared to suppress. Local crises and setbacks are real, but the global trend is strong: power continues to flow away from autocrats and become more fleeting and dispersed.

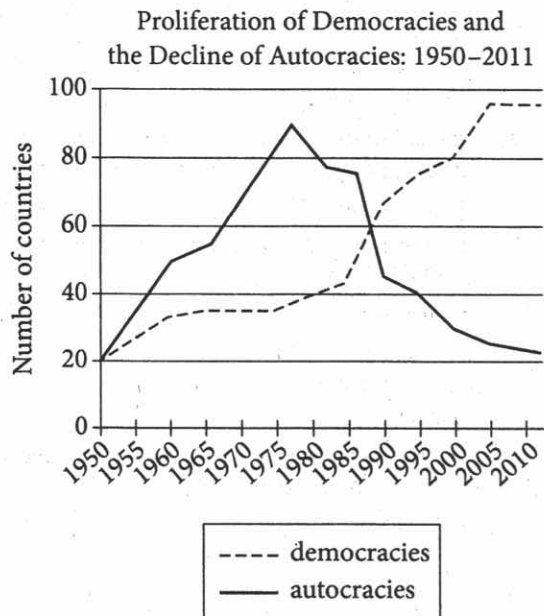
10 The data confirm this transformation: 1977 was the high-water mark of authoritarian rule, with 90 authoritarian countries. A respected source, Freedom House, assessed whether countries are electoral democracies, based on whether they hold  
 15 elections that are regular, timely, open, and fair, even if certain other civic and political freedoms may be lacking. In 2011 it counted 117 of 193 surveyed countries as electoral democracies. Compare that with 1989, when only 69 of 167 countries made the  
 20 grade. Put another way, the proportion of democracies in the world increased by just over half in only two decades.

What caused this global transformation? Obviously local factors were at work, but scholar  
 25 Samuel Huntington noted some big forces as well. Poor economic management by many authoritarian governments eroded their popular standing. A rising middle class demanded better public services, greater participation, and eventually more political freedom.

30 Western governments and activists encouraged dissent and held out rewards for reform, such as membership in NATO or the EU or access to funds from international financial institutions. A newly activist Catholic Church under Pope John Paul II  
 35 empowered opposition in Poland, El Salvador, and the Philippines. Above all, success beget success, a process accelerated by the new reach and speed of mass media. As news of democratic triumphs spread from country to country, greater access to media by  
 40 increasingly literate populations encouraged emulation. In today's digital culture, the force of that factor has exploded.

There have been exceptions, of course—not just countries where democracy has yet to spread but  
 45 others where it has experienced reversals. Larry Diamond, a leading scholar in this field, calls the stalling in recent years in countries like Russia, Venezuela, or Bangladesh a “democratic recession.” Yet against this is mounting evidence that public  
 50 attitudes have shifted. In Latin America, for example, despite persistent poverty and inequality, and constant corruption scandals, opinion polls show greater confidence in civilian government than in the military.

55 Even autocracies are less autocratic today. 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.” With far fewer repressive  
 60 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. How? Elections are central to democracy but they are not the only indicator of  
 65 political openness. Freedom of the press, civil liberties, checks and balances that limit the power of any single institution (including that of the head of state), and other measures convey a sense of a government's grip on society. And the data show that  
 70 on average, even as the number of authoritarian regimes has gone down, the democracy scores of countries that remain politically closed have gone up. The sharpest improvement occurred in the early 1990s, suggesting that the same forces that pushed so  
 75 many countries into the democratic column at that time had profound liberalizing effects in the remaining nondemocratic countries as well.



Adapted from Monty G. Marshall, Keith Jagers, and Ted Robert Gurr. "Political Regime Characteristics and Transitions, 1800–2010," Polity IV Project.

10

Over the course of the passage, the main focus shifts from

- A) a discussion of the increase in democracies and political openness to an analysis of the causes of the increase.
- B) a claim that electoral democracies have become less politically open to a discussion of the effects of the decreased openness.
- C) an explanation of one set of data about a trend toward political openness to an explanation of a conflicting set of data.
- D) a positive portrayal of democracy to a strong denunciation of autocracy.

11

As used in line 20, "put" most nearly means

- A) imposed.
- B) placed.
- C) incited.
- D) stated.

12

As used in line 31, “held out” most nearly means

- A) resisted.
- B) awaited.
- C) avoided.
- D) offered.

13

Which choice best supports the claim that increased political openness is a widespread, global trend?

- A) Line 23 (“What . . . transformation”)
- B) Lines 26-27 (“Poor . . . standing”)
- C) Lines 41-42 (“In today’s . . . exploded”)
- D) Lines 56-59 (“According . . . all”)

14

The passage characterizes the state of political openness in autocratic regimes as unexpected in that

- A) instead of becoming more oppressive, autocracies are becoming more democratic.
- B) data indicate that the regimes are becoming less democratic, while opinion polls indicate that the public believes regimes are becoming more democratic.
- C) despite the recent, well-publicized trend toward democratization, there have been many local setbacks.
- D) in a reversal of the trend over the last decade, political openness in autocracies is on the decline.

15

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 18-22 (“Compare . . . decades”)
- B) Lines 46-50 (“Larry . . . shifted”)
- C) Lines 59-63 (“With far . . . true”)
- D) Lines 73-77 (“The sharpest . . . well”)



16

Which of the following is cited in the passage as an indicator of political openness?

- A) A strong head of state
- B) Freedom of the press
- C) Confidence in the military
- D) Presence of a digital culture

17

According to the graph, the number of autocracies in 1975 was less than the number of

- A) democracies in 1950.
- B) democracies in 1995.
- C) autocracies in 2011.
- D) democracies in 2011.

18

According to the graph, the number of democracies was roughly equal to the number of autocracies in which of the following ranges?

- A) 1975–1980
- B) 1985–1990
- C) 1995–2000
- D) 2005–2010

**Questions 19-28 are based on the following passage and supplementary material.**

This passage is adapted from Bettina Boxall, "Yellowstone Wolves Boost Berry Diet for Grizzlies, Study Says." ©2013 by Los Angeles Times.

In another example of how the return of a top predator can have far-reaching ecological effects, 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.

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.

"The grizzly bear uses some of the same plants that the prey of the wolf uses," said William Ripple, an Oregon State University professor of forest ecosystems and lead author of the study. "The reintroduction of one top predator is potentially affecting another top predator through this food web."

Ripple and his fellow researchers at OSU and Washington State University compared the frequency of fruit found in grizzly bear scat (animal fecal droppings) to elk numbers before and after wolf introduction. Over a 19-year period, they found that the average proportion of fruit in grizzly scat rose significantly after wolves returned to Yellowstone and the elk population fell. The scientists examined and rejected other possible explanations for the smaller, pre-wolf proportion of fruit in grizzly diets—such as climate influences or the operation of open-pit garbage dumps that served as bear mess halls before the last one was closed in 1970.

Previous research by Ripple and colleagues has demonstrated other ways in which the gray wolf's return has had a cascading effect in the Greater Yellowstone Ecosystem, the wildest in the lower 48 states. Ripple's work was the first to show that aspens declined after wolves were eliminated from the park in the 1920s. When wolves returned and drove down the elk numbers, scientists saw a resurgence of aspen, cottonwood, and willows in some parts of the park that has led to an increase in beavers.

"We're in the early stages of this ecosystem recovery. This is what we call passive restoration," Ripple said. "We put the wolf back in and then we let nature take its course." 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. The Yellowstone region's whitebark pines have been dying en masse, the victim of beetle kills promoted by milder winters. Wildlife biologists worry the diminishing nut crop could hurt grizzly survival.

Ripple cautioned that it will take time for berry-producing shrubs to regrow. "It may not be a panacea or a big silver bullet as a food item for the grizzlies."

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."

Annual Counts of Northern Yellowstone Elk and Wolves  
and the Ratio of Wolves per 1,000 Elk, 1986–2004

Year	Winter elk count	Wolf numbers	Wolf/elk ratio
1986	16,286	0	0
1987	17,007	0	0
1988	18,913	0	0
1989	*10,265	0	0
1990	14,829	0	0
1991	*9,465	0	0
1992	12,859	0	0
1993	17,585	0	0
1994	19,045	0	0
1995	16,791	0	0
1996	—**	21	—**
1997	—**	24	—**
1998	11,736	32	2.73
1999	11,742	48	4.09
2000	14,539	44	3.03
2001	13,400	72	5.37
2002	11,969	77	6.43
2003	9,215	84	9.12
2004	8,335	106	12.72

\*Poor counting conditions; count is likely a substantial underestimate.

\*\*Elk count not available in 1996 and 1997.

Adapted from Patrick J. White and R. A. Garrott, "Northern Yellowstone Elk after Wolf Restoration." ©2005 by John Wiley & Sons, Inc.

19

The main purpose of the passage is to

- A) discuss an ecological phenomenon.
- B) analyze a scientific experiment.
- C) resolve an environmental debate.
- D) draw attention to a historic discovery.

20

According to the passage, what was a direct result of the drop in the elk population at Yellowstone National Park?

- A) An investigation of the grizzly bear population
- B) A decrease in the number of aspen trees
- C) An increase in fruit-bearing plants
- D) A surge in the wolf population

21

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 6-7 ("A study . . . what")
- B) Lines 12-15 ("The over-browsed . . . hibernation")
- C) Lines 42-46 ("When . . . beavers")
- D) Lines 49-50 ("We put . . . course")

22

According to the passage, one potential challenge to the survival of the grizzly bear population in Yellowstone National Park is a shortage of

- A) elk.
- B) beetles.
- C) cottonwood trees.
- D) whitebark pine trees.

23

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 27-30 (“Over . . . fell”)
- B) Lines 50-53 (“In the . . . nuts”)
- C) Lines 59-60 (“Ripple . . . regrow”)
- D) Lines 60-62 (“It may . . . grizzlies”)

24

As used in line 10, “browsed” most nearly means

- A) inspected.
- B) skimmed.
- C) destroyed.
- D) grazed.

25

Which choice most closely captures the meaning of the figurative “big silver bullet” referred to in line 61?

- A) Unexpected outcome
- B) Tempting choice
- C) Definitive solution
- D) Dangerous event

26

The main purpose of the final paragraph of the passage is to

- A) advise the reader of some potential limitations of Ripple’s conclusions about the nutritional needs of the grizzly bear.
- B) extend the implications of the relationship between wolves and grizzlies in a particular environment to other animals and contexts.
- C) describe a certain experiment that Ripple will be undertaking in the future to corroborate his findings.
- D) suggest the potential ramifications of reintroducing another species into an already fragile ecosystem.

27

According to the table, the wolf/elk ratio experienced a decrease between which of the following years?

- A) 1998 and 1999
- B) 1999 and 2000
- C) 2000 and 2001
- D) 2003 and 2004

28

Which claim from the passage is most directly supported by the data given in the table?

- A) Elk numbers in Yellowstone National Park showed an overall decline as a result of the introduction of wolves.
- B) Elk numbers in Yellowstone National Park declined every year following the introduction of wolves.
- C) Elk numbers in Yellowstone National Park in any given year decreased as the ratio of wolves to elk that year increased.
- D) Elk numbers in Yellowstone National Park stabilized after an initial decline as wolf population numbers stabilized.

**Questions 29-38 are based on the following passages.**

Passage 1 is adapted from Henry David Thoreau, "Resistance to Civil Government." Originally published in 1849. Passage 2 is adapted from Martin Luther King, Jr., "Letter from Birmingham Jail." ©1986 by the Estate of Martin Luther King, Jr. Thoreau wrote at a time when slavery was legal in the United States. In 1963, King was arrested while protesting racial segregation in Birmingham, Alabama; he wrote this letter while in jail.

**Passage 1**

Must the citizen ever for a moment, or in the least degree, resign his conscience to the legislator? Why has every man a conscience, then? I think that we  
 Line should be men first, and subjects afterward. It is not  
 5 desirable to cultivate a respect for the law, so much as for the right. The only obligation which I have a right to assume is to do at any time what I think right. It is truly enough said that a corporation has no  
 10 conscience; but a corporation of conscientious men is a corporation *with* a conscience. 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. . . .

The mass of men serve the state . . . not as men  
 15 mainly, but as machines, with their bodies. They are the standing army, and the militia, jailers, constables, . . . etc. In most cases there is no free exercise whatever of the judgment or of the moral sense; but they put themselves on a level with wood and earth  
 20 and stones; and wooden men can perhaps be manufactured that will serve the purpose as well. Such command no more respect than men of straw or a lump of dirt. They have the same sort of worth only as horses and dogs. Yet such as these even  
 25 are commonly esteemed good citizens. Others, as most legislators, politicians, lawyers, ministers, and office-holders, serve the state chiefly with their heads; and, as they rarely make any moral distinctions, they are as likely to serve the devil, without *intending* it, as  
 30 God. 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. . . .

35 How does it become a man to behave toward this American government to-day? I answer, that he cannot without disgrace be associated with it. I

cannot for an instant recognize that political organization as *my* government which is the *slave's*  
 40 government also.

**Passage 2**

You express a great deal of anxiety over our willingness to break laws. This is certainly a legitimate concern. Since we so diligently urge people to obey the Supreme Court's decision of 1954  
 45 outlawing segregation in the public schools, at first glance it may seem rather paradoxical for us consciously to break laws. One may well ask: "How can you advocate breaking some laws and obeying others?" The answer lies in the fact that there are  
 50 two types of laws: just and unjust. I would be the first to advocate obeying just laws. One has not only a legal but a moral responsibility to obey just laws. Conversely, one has a moral responsibility to disobey unjust laws. I would agree with St. Augustine that "an  
 55 unjust law is no law at all."

Now, what is the difference between the two? How does one determine whether a law is just or unjust? A just law is a man-made code that squares with the moral law or the law of God. An unjust law  
 60 is a code that is out of harmony with the moral law. To put it in the terms of St. Thomas Aquinas: An unjust law is a human law that is not rooted in eternal law and natural law. Any law that uplifts human personality is just. Any law that degrades  
 65 human personality is unjust. All segregation statutes are unjust because segregation distorts the soul and damages the personality. It gives the segregator a false sense of superiority and the segregated a false sense of inferiority. . . . Thus it is that I can urge  
 70 men to obey the 1954 decision of the Supreme Court, for it is morally right; and I can urge them to disobey segregation ordinances, for they are morally wrong. . . .

In no sense do I advocate evading or defying the  
 75 law, as would the rabid segregationist [by refusing to comply with the Supreme Court ruling]. That would lead to anarchy. One who breaks an unjust law must do so openly, lovingly, and with a willingness to accept the penalty. I submit that an individual who  
 80 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.

29

As used in line 22, “command” most nearly means

- A) order.
- B) dominate.
- C) overlook.
- D) deserve.

30

Thoreau makes which point about people who follow their consciences?

- A) They often band together with other entities to form corporations.
- B) They tend to have mutually antagonistic relationships with their governments.
- C) They generally believe that the exercise of the moral sense is what makes them human.
- D) They hold their legislators to a different moral standard than that to which they hold themselves.

31

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 1-2 (“Must . . . legislator”)
- B) Lines 7-10 (“It is . . . conscience”)
- C) Lines 17-21 (“In most . . . well”)
- D) Lines 30-34 (“A very . . . by it”)

32

According to King, an unjust statute should not be

- A) regarded as having moral authority.
- B) broken in a manner intended to attract attention.
- C) viewed as detrimental to the human spirit.
- D) used to enforce obedience to moral law.

33

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 49-50 (“The answer . . . unjust”)
- B) Lines 51-52 (“One . . . laws”)
- C) Lines 53-55 (“one . . . all”)
- D) Lines 64-65 (“Any . . . unjust”)

34

As used in line 57, “determine” most nearly means

- A) establish.
- B) regulate.
- C) direct.
- D) limit.

35

The primary purpose of each passage is to

- A) make an argument about the relationship between the individual and the law.
- B) advance a view on how laws could be made more just.
- C) question a claim that the morality of actions depends on their consequences.
- D) discuss a change in the nature of the state and its power over the individual.

36

Both authors would most likely agree with which statement about people who obey their government's statutes?

- A) They fail to follow the guidance of their consciences.
- B) They are incapable of exercising moral judgment.
- C) They may not be acting in accordance with justice.
- D) They value personal morality over the public good.

37

In the passages, a significant difference in how the two authors discuss morality is that Thoreau indicates that

- A) very few people follow their consciences, while King indicates that most people consistently adhere to moral laws.
- B) people should do what they judge to be right, while King indicates that people should follow a universal moral code.
- C) the morality of an action derives from its legal status, while King indicates that morality and human law are distinct.
- D) even morally good laws should be disobeyed, while King indicates that people should follow just laws.

38

Assuming that he agrees with the assertions in the final paragraph of Passage 1, King would most likely recommend which course of action to Thoreau?

- A) Thoreau should obey laws upholding slavery while they are in force but should work to repeal them.
- B) Thoreau should view laws upholding slavery as immoral but should not break them since doing so would lead to anarchy.
- C) Thoreau should break laws upholding slavery and in doing so should neither hide his actions nor try to avoid punishment.
- D) Thoreau should openly criticize laws upholding slavery but should follow them since committing a crime would degrade his personality.

**Questions 39-47 are based on the following passage.**

This passage is adapted from Ed Yong, "Gut Bacteria Allows Insect Pest to Foil Farmers." ©2013 by National Geographic Society.

Here is a lesson that we're going to be taught again and again in the coming years: Most animals are not just animals. They're also collections of microbes. If you really want to understand animals, you'll also have to understand the world of microbes inside them. In other words, zoology is ecology.

Consider the western corn rootworm—a beetle that's a serious pest of corn in the United States. The adults have strong preferences for laying eggs in corn fields, so that their underground larvae hatch into a feast of corn roots. This life cycle depends on a continuous year-on-year supply of corn. Farmers can use this dependency against the rootworm, by planting soybean and corn in alternate years. These rotations mean that rootworms lay eggs into corn fields but their larvae hatch among soybean, and die.

But the rootworms have adapted to this strategy by reducing their strong instincts for laying eggs in corn. These rotation-resistant females might lay among soybean fields, so their larvae hatch into a crop of corn.

There are almost certainly genetic differences that separate the rotation-resistant rootworms from their normal peers, but what are they? Researchers at the University of Illinois have been studying the problem since 2000 and, despite generating a vast mountain of data, have failed to find the genes in question.

"The western corn rootworm has been an enigma for a long time," says Manfredo Seufferheld. "This insect has the ability to adapt to practically all control methods deployed against it, including crop rotation. After many years of research about the mechanisms of rotation resistance, results were mostly inconclusive."

So, Seufferheld looked elsewhere. Rather than focusing on the rootworm's own genes, he studied the genes of the bacteria in its gut . . . and found some answers. The rotation-resistant varieties have very different gut bacteria from the normal ones. And when the team killed these microbes with antibiotics, they severely reduced the beetle's ability to cope with rotation.

"The bad guy in the story—the western corn rootworm—was actually part of a multi-species conspiracy," says Joe Spencer, who was part of the study.

The team, including graduate student Chia-Ching Chu, found that a third of the rootworms' gut bacteria comprise species that are unique to either the resistant or normal varieties. These two factions also differ in the relative numbers of the bacteria that they share.

These different microbes give the resistant beetles an edge when eating soybeans. The rootworms digest the protein in their meals using enzymes called cysteine proteases, and soybeans defend themselves with substances that can block these enzymes. But Chu found that the more the beetles' bacteria differed from the normal set, the higher the levels of cysteine proteases in their guts. By avoiding indigestion, these beetles were better at surviving among soybeans, and more likely to lay their eggs there.

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.

39

Over the course of the passage, the main focus shifts from a

- A) statement about the challenge posed by a particular insect to an indication of why that challenge was easy to overcome.
- B) summary of a once-unexplained natural phenomenon to a biography of the scientists who researched that phenomenon.
- C) description of a problem affecting agriculture to an explanation of how scientists identified the cause of that problem.
- D) discussion about a scientific field to an anecdote showing how research is done in that field.



40

The statement “zoology is ecology” (line 6) mainly serves to

- A) propose that two areas of scientific knowledge be merged.
- B) point out that knowledge obtained in one field of research will lead to expertise in another.
- C) assert a point about biological science that is supported by the example in the passage.
- D) suggest that one field of scientific research has completely supplanted another.

41

According to the passage, one similarity between rotation-resistant rootworms and normal rootworms is that they both

- A) reduce crop productivity by extracting nutrients from the soil.
- B) produce larvae that feed on the plant roots of crops.
- C) adapt to crop rotation by maintaining high levels of enzymes in their guts.
- D) contain the same quantity and composition of bacteria in their guts.

42

Which choice most clearly provides information indicating how some rootworms have overcome farmers’ efforts to eradicate them?

- A) Lines 15-17 (“These . . . die”)
- B) Lines 18-20 (“But . . . corn”)
- C) Lines 25-28 (“Researchers . . . question”)
- D) Lines 41-43 (“And . . . rotation”)

43

The central claim in the fourth paragraph (lines 23-35) is that

- A) extensive study of the rootworm’s genes was insufficient to determine why some rootworms are rotation resistant.
- B) the rootworm’s ability to adapt to pest control methods is unique among insects.
- C) the genetic profile of rootworms is significantly more complex than researchers initially believed.
- D) our current understanding of genetics is inadequate to allow researchers to understand why some rootworms are rotation resistant.

44

As used in line 24, “separate” most nearly means

- A) distinguish.
- B) discharge.
- C) extract.
- D) scatter.

45

According to the passage, the gut bacteria of rotation-resistant rootworms

- A) help the rootworms survive in soybean crops.
- B) are responsible for lowering the amount of cysteine protease in the rootworms’ guts.
- C) make the rootworms less vulnerable to being killed by antibiotics.
- D) are transferred to the larvae that hatch from the rootworms’ eggs.

46

Which choice provides the best evidence for the answer to the previous question?

- A) Lines 29-30 (“The western . . . Seufferheld”)
- B) Lines 39-40 (“The rotation-resistant . . . ones”)
- C) Lines 44-47 (“The bad . . . study”)
- D) Lines 54-55 (“These . . . soybeans”)

47

The main idea of the last paragraph is that

- A) cysteine proteases are harmful to rootworms when present in large quantities in the body.
- B) eggs laid by rotation-resistant rootworms will hatch into crops of soybeans.
- C) bacteria unique to rotation-resistant rootworms allow them to digest soybeans.
- D) rotation-resistant rootworms do not digest soybeans using cysteine proteases.

**STOP**

**If you finish before time is called, you may check your work on this section only.  
Do not turn to any other section.**

## Writing and Language Test

35 MINUTES, 44 QUESTIONS

Turn to Section 2 of your answer sheet to answer the questions in this section.

### DIRECTIONS

Each passage below is accompanied by a number of questions. For some questions, you will consider how the passage might be revised to improve the expression of ideas. For other questions, you will consider how the passage might be edited to correct errors in sentence structure, usage, or punctuation. A passage or a question may be accompanied by one or more graphics (such as a table or graph) that you will consider as you make revising and editing decisions.

Some questions will direct you to an underlined portion of a passage. Other questions will direct you to a location in a passage or ask you to think about the passage as a whole.

After reading each passage, choose the answer to each question that most effectively improves the quality of writing in the passage or that makes the passage conform to the conventions of standard written English. Many questions include a "NO CHANGE" option. Choose that option if you think the best choice is to leave the relevant portion of the passage as it is.

Questions 1-11 are based on the following passage.

### For the Love of Coffee

Ever since **1** introducing coffee to Italy several centuries ago, it has been a ubiquitous part of Italian culture. **2** However, coffee is so central to Italian culture that one cannot visit any city or town in Italy without seeing several coffeehouses (called *caffetterie* in

1

- A) NO CHANGE
- B) they introduced coffee
- C) their introduction of coffee
- D) coffee was introduced

2

- A) NO CHANGE
- B) In fact,
- C) Even so,
- D) Despite this history,

Italian). Such coffeehouses have existed since 1640, when the first was established in Venice, and **3** it has since become a part of Italy's national identity. It is not uncommon in Italy for people to make two to three trips a day to their favorite *caffetteria*, and often people are so selective about their coffee that they will frequent only one establishment. But it is not simply the coffee that creates such enthusiasm for coffeehouses among those **4** which love them; the social aspect of the *caffetteria* may play nearly as great a role as the coffee itself.

3

- A) NO CHANGE
- B) it will
- C) they have
- D) they had

4

- A) NO CHANGE
- B) who loves
- C) who love
- D) whom love

Each *caffetteria* functions as a social hub in its neighborhood, and the way in which most patrons consume their coffee **5** contribute to this fact. Few *caffetteria* patrons sit at tables, since most coffeehouses in Italy charge a premium for table service, **6** although sometimes it's worth the cost to be able to sit and rest. Nor can patrons take their drinks elsewhere: to-go cups

5

- A) NO CHANGE
- B) contributes
- C) contributing
- D) which contributes

6

Which choice gives an example that most clearly supports the statement made earlier in the sentence?

- A) NO CHANGE
- B) a fee that can amount to three to four times as much as the price per drink.
- C) which can come as a surprise to tourists who are not forewarned.
- D) which simply means being waited on at your table.

are not available at typical coffeehouses. **7** Instead, most regular patrons of a *caffetteria* drink their coffee standing. They do this, often shoulder-to-shoulder, at a counter or bar. Normally, those drinking their coffee at a bar will also chat with each other and the person making coffee behind the bar. This practice, which combines social interaction with coffee drinking, is the most popular way to enjoy a cup of coffee in Italy.

7

Which choice most effectively combines the underlined sentences?

- A) Instead, most regular patrons of a *caffetteria* drink their coffee standing, often shoulder-to-shoulder, at a counter or bar.
- B) Instead, most regular patrons of a *caffetteria* drink their coffee, often standing shoulder-to-shoulder, which they do at a counter or bar.
- C) Instead, most regular patrons of a *caffetteria* drink their coffee; they do it often standing shoulder-to-shoulder at a counter or bar.
- D) Most regular patrons of a *caffetteria* drink their coffee shoulder-to-shoulder at a counter or bar, standing there instead.

8 Indeed, many Italian coffee enthusiasts agree that there is only one 9 correct way to make coffee: this involves filtering water through freshly ground coffee beans at specific temperatures and pressures, which produces the concentrated form of coffee known as espresso. This type of coffee is drunk in Italy in several

8

Which choice best introduces the paragraph?

- A) Coffee consumption does not necessarily have to take place in a *caffetteria*; espresso-based drinks can also be made in the home.
- B) In Italy, the fervor for the coffee-drinking experience extends beyond the drinking of coffee to the making of it and the timing of its consumption.
- C) There are as many different ways to make coffee in Italy as there are coffee drinkers, and there is little agreement about which way is best.
- D) Not all Italians share in this enthusiasm for coffee, of course.

9

- A) NO CHANGE
- B) correct and proper
- C) properly correct
- D) appropriate and correct

forms, either unadulterated or with varying amounts of milk, and each form has a different name. An espresso mixed with frothed and steamed milk **10** is a cappuccino: for example, while an espresso with just a dollop of steamed milk on top is a caffè macchiato. There are also respected traditions about when these different coffee drinks should be consumed: while cappuccino is a popular morning drink, espresso, either plain or diluted with water, is usually the drink of choice for coffee drinkers in Italy in the afternoon and evening. **11**

10

- A) NO CHANGE
- B) is a cappuccino, for example:
- C) is, a cappuccino for example—
- D) is a cappuccino, for example,

11

At this point, the writer is considering adding the following sentence.

These espresso-based coffee drinks have become increasingly popular in the United States over the past several decades.

Should the writer make this addition here?

- A) Yes, because it adds force to the writer's argument about the popularity of coffeehouses in Italy.
- B) Yes, because it elaborates on the statement in the previous sentence about different types of drinks.
- C) No, because it suggests that coffee drinking is not as popular in Italy as the writer claims it is.
- D) No, because it digresses from the main topic of how coffee is regarded in Italy.



Questions 12-22 are based on the following passage and supplementary material.

### A Study in Arctic Migration

Each year, many species of shorebirds migrate from locations in the Southern Hemisphere to their breeding grounds in the **12** Arctic. A journey of thousands of kilometers that requires frequent stops to fuel up. The risk of death is significant, and the Arctic is an inhospitable region for most of the **13** year, yet the shorebirds never failing to make their annual pilgrimage.

Come spring, the Arctic becomes a suitable habitat, providing many benefits: an abundant supply of food, permanent daylight, ample nesting space, fewer pathogens, and fewer predators to invade the nests of these ground-dwelling birds. These benefits are found in all regions of the **14** Arctic regardless of latitude yet some shorebirds continue on to the high Arctic. If these birds are simply looking for open space and enough food to eat, then why not end their long journey in the low Arctic? Continuing on to the north requires more fuel and carries an even greater risk of **15** mortality if the birds continue on. The most likely reason certain shorebirds head to the high Arctic is to escape their predators.

12

- A) NO CHANGE
- B) Arctic, a
- C) Arctic; a
- D) Arctic; which is a

13

- A) NO CHANGE
- B) year, the shorebirds never fail
- C) year, yet the shorebirds never fail
- D) year; yet the shorebirds never failing

14

- A) NO CHANGE
- B) Arctic, regardless of latitude
- C) Arctic, regardless of latitude,
- D) Arctic: regardless of latitude,

15

- A) NO CHANGE
- B) mortality if they keep going.
- C) mortality and death.
- D) mortality.

[1] A four-year study by a team of Canadian scientists, headed by student Laura McKinnon of the Université du Québec, **16** provide evidence in support of this hypothesis. [2] The scientists created artificial nests that resembled a typical shorebird's nest. [3] Then each year, during the shorebirds' breeding season, forty of the nests were placed in each of seven locations that ranged in latitude from the low Arctic to the high Arctic. [4] Each nest had been baited with four **17** quail egg's, which are similar in size and shape to a shorebird's eggs. [5] The scientists returned to the nests many times over nine days to check how many eggs remained in the nests. [6] A nest was said to have survived if, at the end of the nine days, it contained at least one undisturbed quail egg.

**18****16**

- A) NO CHANGE
- B) provides
- C) are providing
- D) have provided

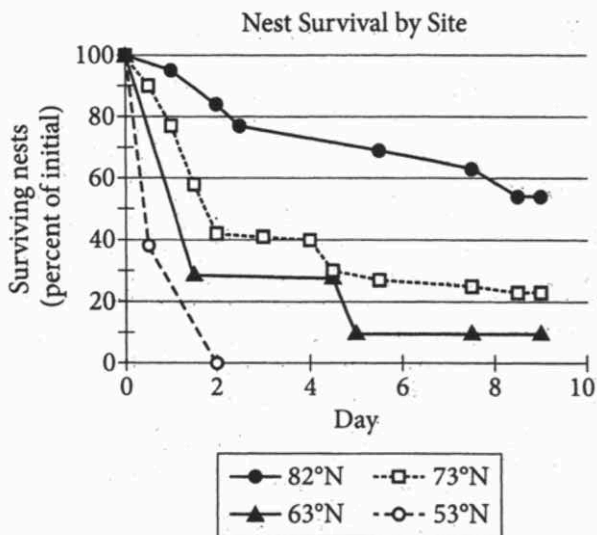
**17**

- A) NO CHANGE
- B) quail eggs,
- C) quail eggs',
- D) quails eggs,

**18**

To make this paragraph most logical, sentence 5 should be placed

- A) where it is now.
- B) after sentence 1.
- C) after sentence 2.
- D) after sentence 6.



Adapted from L. McKinnon et al., "Lower Predation Risk for Migratory Birds at High Latitudes." ©2010 by American Association for the Advancement of Science.

The figure shows the results for the nesting **19** sites, furthermore, at four of the seven locations, averaged over the four years of the study. The **20** number of predators invading the nests increased over time at each location. This result confirmed that predators were present at the researchers' chosen locations. The researchers found that the percent of **21** surviving nests was greater at locations having higher latitudes. For example, on day 9, approximately 55 percent of nests were found to have survived at the 82°N location compared to approximately 10 percent of nest survival at the 63°N location. This

19

- A) NO CHANGE
- B) sites
- C) sites, however,
- D) sites, in addition,

20

Which choice makes the writer's description of data represented in the figure most accurate?

- A) NO CHANGE
- B) numbers of predators invading the nests decreased
- C) percent of surviving nests decreased
- D) percent of surviving nests increased

21

Which choice makes the writer's description of data represented in the figure most accurate?

- A) NO CHANGE
- B) surviving nests was smaller
- C) surviving nests remained the same
- D) eggs was much lower

study provides the first known quantifiable evidence for the previously unanswered question of why shorebirds continue on to the high Arctic. **22** The shorebirds risk their own survival by flying farther. Their offspring have a better chance of survival because fewer predators invade the nests.

22

Which choice most effectively combines the underlined sentences?

- A) Although the shorebirds risk their own survival by flying farther, their offspring have a better chance of survival because fewer predators invade the nests.
- B) The shorebirds risk their own survival because they fly farther; in addition, their offspring have a better chance of survival because fewer predators invade the nests.
- C) Flying farther and risking their own survival is what the shorebirds do, and this gives their offspring a better chance of survival because fewer predators invade the nests.
- D) The shorebirds' offspring have a better chance of survival, fewer predators invade their nests, and they risk their own survival by flying farther.

Questions 23-33 are based on the following passage.

### Teaching the World to Swing

In 1924, when jazz trumpeter Louis Armstrong rehearsed with Fletcher Henderson's band for the first time, he shocked Henderson by refusing to **23** bond with the score as written and playing notes at whatever volume he wanted. The other band members, who were used to playing standard dance music in meticulous, predictable arrangements, purportedly responded to Armstrong's untraditional methods with skepticism and derision. Over a short time, though, Armstrong won over Henderson and the band with his undeniably brilliant musical talent.

As band members grew to admire Armstrong's masterful **24** improvisations. They in turn began to experiment with incorporating improvised solos of their own. In one of the earliest recordings of Armstrong playing with Henderson's band, the band mainly follows the standard written arrangement of a dance song. The exceptions are a couple of short solos—not only **25** Armstrong's performances but also by saxophonist Coleman Hawkins. Not long afterward, the group's style transformed dramatically. A 1925 recording of "Sugarfoot Stomp" by Henderson's band features an extended solo by Armstrong, his trumpet blazing out against the saxophone backup. **26** Band member Howard Scott recalls a particular night at the Roseland Ballroom: "My goodness, people stopped dancing to come around and listen to him. . . . The next night you couldn't get into the place."

23

- A) NO CHANGE
- B) emulate
- C) adhere to
- D) cohere with

24

- A) NO CHANGE
- B) improvisations they
- C) improvisations; they
- D) improvisations, they

25

- A) NO CHANGE
- B) Armstrong-performed solos
- C) by Armstrong
- D) Armstrong solos

26

At this point, the writer is considering adding the following sentence.

With these stunning solos, Armstrong became a sensation with the patrons of local dance halls.

Should the writer make this addition here?

- A) Yes, because it sets up the quotation in the following sentence.
- B) Yes, because it explains why Armstrong was skilled at improvisation.
- C) No, because it merely repeats an idea stated earlier in the paragraph.
- D) No, because it blurs the focus of the paragraph.

**27** In addition to incorporating solos into its performances, the band evolved in other ways. Henderson had been working with musician and composer Don Redman to develop arrangements of songs that used a call-and-response **28** structure. According to jazz historians Gary Giddins and Scott DeVeaux, Redman acknowledged that he had, in fact, **29** adjusted and altered the structure of his musical arrangements in part to accommodate Armstrong's distinct style. Giddins and DeVeaux describe the result as

27

The writer wants a transition that makes a connection to the main topic of the previous paragraph. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) Thanks to the enthusiastic patrons of New York City dance halls,
- C) In addition to performing music arranged by Don Redman,
- D) Despite their reputation as a somewhat conservative dance orchestra,

28

The writer is considering revising the underlined portion to the following.

structure that, for example, featured a melody played by the saxophone section followed by an answer from the trumpet section.

Should the writer make this revision?

- A) Yes, because it mentions the musical instrument that was associated with Armstrong.
- B) Yes, because it clarifies a term used to describe Redman's arrangements.
- C) No, because it interrupts the discussion of Redman's arrangements with irrelevant information.
- D) No, because it diverges from the paragraph's point about Henderson.

29

- A) NO CHANGE
- B) adjusted and changed
- C) adjusted, through reworking,
- D) adjusted

music **30** that, “began to take on a commanding directness and sharper rhythmic gait.”

Armstrong left Henderson’s band in 1925. His influence, **31** for instance, is discernible in the band’s later recordings. The collaboration between Armstrong and Henderson had put into motion a significant stylistic

30

- A) NO CHANGE
- B) that—
- C) that
- D) that:

31

- A) NO CHANGE
- B) therefore,
- C) likewise,
- D) however,

shift in jazz music: the polished sound of dance-hall music had given **32** away to the prominent solo features and call-and-response **33** arrangements, that would become hallmarks of the 1930s swing era music.

32

- A) NO CHANGE
- B) way to
- C) in to
- D) away for

33

- A) NO CHANGE
- B) arrangements, which
- C) arrangements, these
- D) arrangements that



Questions 34-44 are based on the following passage.

### Cleveland Rocks (for Artists)

[1] It used to be that a move to a metropolis such as New York City was an inevitable step for aspiring artists. [2] Back when geography was everything, an artist had to get her painting, song, poem, or dance in front of as large an audience as possible. [3] To some degree, these tales may have been true. [4] That was much easier in a city with a teeming population. [5] Geographical proximity helped artists meet other artists, be inspired by them, and compete with them. [6] Stories of talented, ambitious young people getting by on “pluck and luck” in the big city were commonplace. [7] These days, however, they are more fiction than fact. **34**

Today the United States economy is much less forgiving. Once **35** an artist could make a living as a temporary office worker or a waiter, leaving plenty of time to practice your art. In many of the nation’s largest cities, **36** therefore, this life is no longer possible. There are very few cheap, empty lofts waiting to be transformed with an attitude and a paintbrush. Real estate prices have skyrocketed, and survival, for all but the luckiest few, has

34

To make this paragraph most logical, sentence 3 should be placed

- A) where it is now.
- B) after sentence 1.
- C) after sentence 4.
- D) after sentence 6.

35

- A) NO CHANGE
- B) artists
- C) one
- D) you

36

- A) NO CHANGE
- B) however,
- C) consequently,
- D) for instance,

become more difficult. In many large cities, affordable theaters, jazz cafes, and art galleries are being replaced by **37** other places, including expensive restaurants, couture boutiques, and exclusive nightclubs, so there are fewer and fewer opportunities for the artist just starting out. When business leaders in New York, for example, go **38** so far as to declare the city a “luxury brand,” they are not appealing to potential customers who struggle to survive as artists.

37

Which choice most effectively sets up the list of examples that follows in the sentence and completes the contrast introduced earlier in the sentence?

- A) NO CHANGE
- B) locations where artists are unlikely to spend money:
- C) upscale venues such as
- D) attractive options such as

38

- A) NO CHANGE
- B) too far
- C) farther
- D) DELETE the underlined portion.

One exception to this trend **39** is Cleveland, Ohio; a great place for young artists. Once a center for manufacturing, Cleveland still boasts a well-maintained infrastructure though many factories and jobs have moved overseas. The city is working hard to attract artists. In 2013 it hosted a “Welcome to Cleveland” weekend, providing a steep discount for hotels, paying fully for ground transportation, and offering an array of meals and free cultural events to artists who were willing to visit the city and consider **40** moving to Cleveland. Perhaps the real sign of welcome is Cleveland’s artist housing plan: homes will be sold to qualifying artists at prices similar to **41** an economy car. Cleveland may be doing the most to attract the creative class, but many

39

- A) NO CHANGE
- B) is: Cleveland, Ohio, a
- C) is Cleveland, Ohio—a
- D) is Cleveland, Ohio (a

40

- A) NO CHANGE
- B) the possibility of a potential move to Cleveland.
- C) what it would be like to move there.
- D) moving there.

41

- A) NO CHANGE
- B) that of an economy car.
- C) an economy car’s.
- D) those of economy cars.

other smaller cities, including Pittsburgh, Pennsylvania; Corvallis, Oregon; and Burlington, Vermont, are following **42** its lead. **43**

If you're an artist trying to reach an audience, move to a place where you can live well and where you are needed. Don't **44** undermine smaller cities such as Cleveland as you search for your place of inspiration.

42

- A) NO CHANGE
- B) they're
- C) it's
- D) their

43

At this point, the writer is considering adding the following sentence.

In many cases, communities that are arts friendly are bicycle friendly too.

Should the writer add this sentence here?

- A) Yes, because it adds support to the writer's stated claim that Cleveland is a great place for artists to live.
- B) Yes, because it helps define the lifestyle priorities of those to whom the writer refers as the "creative class."
- C) No, because it adds a loosely related detail that the writer doesn't connect to the claims made in the paragraph.
- D) No, because it should be placed instead in the passage's final paragraph to support the claim that artists can live well in smaller cities.

44

- A) NO CHANGE
- B) discount
- C) blow off
- D) give the cold shoulder to

## STOP

**If you finish before time is called, you may check your work on this section only.  
Do not turn to any other section.**



# Math Test – No Calculator

25 MINUTES, 17 QUESTIONS

Turn to Section 3 of your answer sheet to answer the questions in this section.

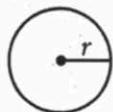
## DIRECTIONS

For questions 1-13, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 14-17, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 14 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

## NOTES

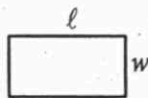
- The use of a calculator is **not permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- Unless otherwise indicated, the domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

## REFERENCE

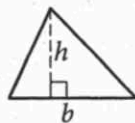


$$A = \pi r^2$$

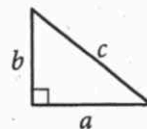
$$C = 2\pi r$$



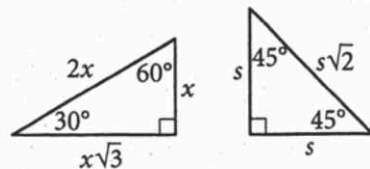
$$A = \ell w$$



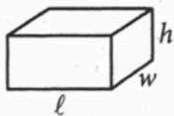
$$A = \frac{1}{2}bh$$



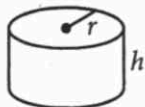
$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}\ell wh$$

The number of degrees of arc in a circle is 360.

The number of radians of arc in a circle is  $2\pi$ .

The sum of the measures in degrees of the angles of a triangle is 180.



1

Which of the following is an equivalent form of the expression  $15x + 24ax$  ?

- A)  $39ax^2$
- B)  $39(a + 2x)$
- C)  $(5 + 8a)x$
- D)  $(15 + 24a)x$

2

The formula  $d = rt$  is used to calculate the distance an object travels over a period of time,  $t$ , at a constant rate,  $r$ . Based on this formula, what is the rate,  $r$ , in terms of  $d$  and  $t$  ?

- A)  $r = \frac{d}{t}$
- B)  $r = dt$
- C)  $r = \frac{t}{d}$
- D)  $r = d - t$

3

Which of the following ordered pairs  $(x, y)$  satisfies both equations  $y = x^2 + 3x - 4$  and  $x = y - 4$  ?

- A)  $(0, -4)$
- B)  $(2, 6)$
- C)  $(3, 14)$
- D)  $(5, 9)$

4

Which of the following is a solution to the equation  $2x^2 + 4x = 3 + 3x^2$  ?

- A)  $-1$
- B)  $0$
- C)  $3$
- D)  $6$



5

$$-3x - 4y = 20$$

$$x - 10y = 16$$

If  $(x, y)$  is the solution to the system of equations above, what is the value of  $x$  ?

- A) -14
- B) -12
- C) -4
- D) 16

6

The equation  $y = 36 + 18x$  models the relationship between the height  $y$ , in inches, of a typical golden delicious apple tree and the number of years,  $x$ , after it was planted. If the equation is graphed in the  $xy$ -plane, what is indicated by the  $y$ -intercept of the graph?

- A) The age, in years, of a typical apple tree when it is planted
- B) The height, in inches, of a typical apple tree when it is planted
- C) The number of years it takes a typical apple tree to grow
- D) The number of inches a typical apple tree grows each year

7

Giovanni wants to buy shirts that cost \$19.40 each and sweaters that cost \$24.80 each. An 8% sales tax will be applied to the entire purchase. If Giovanni buys 2 shirts, which equation relates the number of sweaters purchased,  $p$ , and the total cost in dollars,  $y$  ?

- A)  $1.08(38.80 + 24.80p) = y$
- B)  $38.80 + 24.80p = 0.92y$
- C)  $38.80 + 24.80p = 1.08y$
- D)  $0.92(38.80 + 24.80p) = y$

8

A line is graphed in the  $xy$ -plane. If the line has a positive slope and a negative  $y$ -intercept, which of the following points cannot lie on the line?

- A)  $(-3, -3)$
- B)  $(-3, 3)$
- C)  $(3, -3)$
- D)  $(3, 3)$



9

A parachute design uses 18 separate pieces of rope. Each piece of rope must be at least 270 centimeters and no more than 280 centimeters long. What inequality represents all possible values of the total length of rope  $x$ , in centimeters, needed for the parachute?

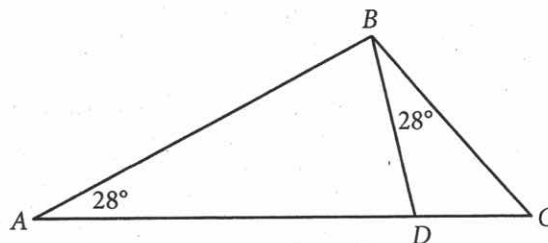
- A)  $270 \leq x \leq 280$
- B)  $4,860 \leq x \leq 4,870$
- C)  $4,860 \leq x \leq 5,040$
- D)  $5,030 \leq x \leq 5,040$

10

A carpenter has \$60 with which to buy supplies. The carpenter needs to buy both nails and screws. Nails cost \$12.99 per box, and screws cost \$14.99 per box. If  $n$  represents the number of boxes of nails and  $s$  represents the number of boxes of screws, which of the following systems of inequalities models this situation?

- A)  $\begin{cases} 12.99n + 14.99s \geq 60 \\ n + s \leq 1 \end{cases}$
- B)  $\begin{cases} 12.99n + 14.99s \leq 60 \\ n + s \leq 1 \end{cases}$
- C)  $\begin{cases} 12.99n + 14.99s \geq 60 \\ n \geq 1 \\ s \geq 1 \end{cases}$
- D)  $\begin{cases} 12.99n + 14.99s \leq 60 \\ n \geq 1 \\ s \geq 1 \end{cases}$

11



In the figure above, which of the following ratios has

the same value as  $\frac{AB}{BC}$  ?

- A)  $\frac{BD}{DC}$
- B)  $\frac{BC}{AC}$
- C)  $\frac{AD}{BD}$
- D)  $\frac{DC}{BC}$





12

$$(x^2y^3)^{\frac{1}{2}}(x^2y^3)^{\frac{1}{3}} = x^{\frac{a}{3}}y^{\frac{a}{2}}$$

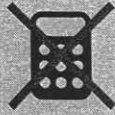
If the equation above, where  $a$  is a constant, is true for all positive values of  $x$  and  $y$ , what is the value of  $a$ ?

- A) 2
- B) 3
- C) 5
- D) 6

13

If the equation  $y = (x - 6)(x + 12)$  is graphed in the  $xy$ -plane, what is the  $x$ -coordinate of the parabola's vertex?

- A) -6
- B) -3
- C) 3
- D) 6



**DIRECTIONS**

For questions 14-17, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as  $3\frac{1}{2}$  must be gridded as 3.5 or  $7/2$ . (If 

3	1	/	2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

 is entered into the grid, it will be interpreted as  $\frac{31}{2}$ , not  $3\frac{1}{2}$ .)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Answer:  $\frac{7}{12}$

Write answer in boxes. →

7	/	1	2
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Fraction line

Grid in result.

Answer: 2.5

2	.	5	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

← Decimal point

Acceptable ways to grid  $\frac{2}{3}$  are:

2	/	3	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

.	6	6	6
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
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1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

.	6	6	7
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3
4	4	4	4
5	5	5	5
6	6	6	6
7	7	7	7
8	8	8	8
9	9	9	9

Answer: 201 – either position is correct

2	0	1	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3

2	0	1	
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0
1	1	1	1
2	2	2	2
3	3	3	3

**NOTE:** You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



14

$$21x + 14 = 7(3x + a)$$

In the equation above,  $a$  is a constant. For what value of  $a$  does the equation have an infinite number of solutions?

15

Julienne practiced her dance routine for twice as many minutes on Monday as she did on Tuesday. She practiced her routine those two days for a total of 2 hours and 15 minutes. For how many minutes did Julienne practice her dance routine on Monday?

16

In the expression below,  $a$  is an integer.

$$12x^2 + ax - 20$$

If  $3x + 4$  is a factor of the expression above, what is the value of  $a$  ?

17

$$(ax + by)(cx - dy)$$

In the expression above,  $a$ ,  $b$ ,  $c$ , and  $d$  are non-zero constants and  $ad = bc$ . If  $ac = 18$  and  $bd = 50$ , what is the value of the coefficient of the  $xy$  term when the expression is multiplied out and the like terms are collected?

**STOP**

If you finish before time is called, you may check your work on this section only.

Do not turn to any other section.



# Math Test – Calculator

45 MINUTES, 31 QUESTIONS

Turn to Section 4 of your answer sheet to answer the questions in this section.

## DIRECTIONS

For questions 1-27, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 28-31, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 28 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

## NOTES

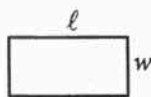
1. The use of a calculator **is permitted**.
2. All variables and expressions used represent real numbers unless otherwise indicated.
3. Figures provided in this test are drawn to scale unless otherwise indicated.
4. All figures lie in a plane unless otherwise indicated.
5. Unless otherwise indicated, the domain of a given function  $f$  is the set of all real numbers  $x$  for which  $f(x)$  is a real number.

## REFERENCE

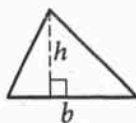


$$A = \pi r^2$$

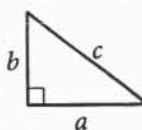
$$C = 2\pi r$$



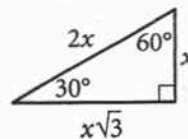
$$A = \ell w$$



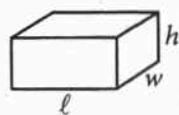
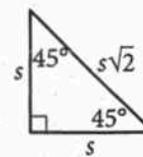
$$A = \frac{1}{2}bh$$



$$c^2 = a^2 + b^2$$



Special Right Triangles



$$V = \ell wh$$



$$V = \pi r^2 h$$



$$V = \frac{4}{3}\pi r^3$$



$$V = \frac{1}{3}\pi r^2 h$$



$$V = \frac{1}{3}\ell wh$$

The number of degrees of arc in a circle is 360.

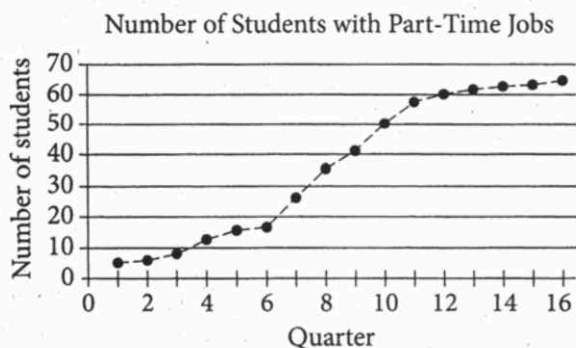
The number of radians of arc in a circle is  $2\pi$ .

The sum of the measures in degrees of the angles of a triangle is 180.



1

A high school counselor conducted a study over 16 consecutive quarters to determine the number of students with part-time jobs. Each student in the 2014 graduating class is surveyed once per quarter for all four years of high school. The graph below shows the data for each quarter the survey was conducted.



During which of the following periods is the increase in the number of students with part-time jobs largest?

- A) Quarters 4 through 6
- B) Quarters 7 through 10
- C) Quarters 11 through 14
- D) Quarters 13 through 16

2

Eli saves money each month to buy a new computer. The total amount he has saved,  $T$ , can be calculated by the equation  $T = 83 + 30m$ , where  $m$  is the number of months since he started saving. What does the number 83 represent in the equation?

- A) The amount of money Eli started with
- B) The number of months Eli has been saving
- C) The amount of money Eli saves each month
- D) The total amount of money Eli wants to save

3

According to the Department of Agriculture, consuming 100 grams of banana provides 0.15 milligram of zinc. Which of the following is closest to the number of milligrams of zinc provided by 140 grams of banana?

- A) 0.15
- B) 0.21
- C) 0.25
- D) 0.93

4

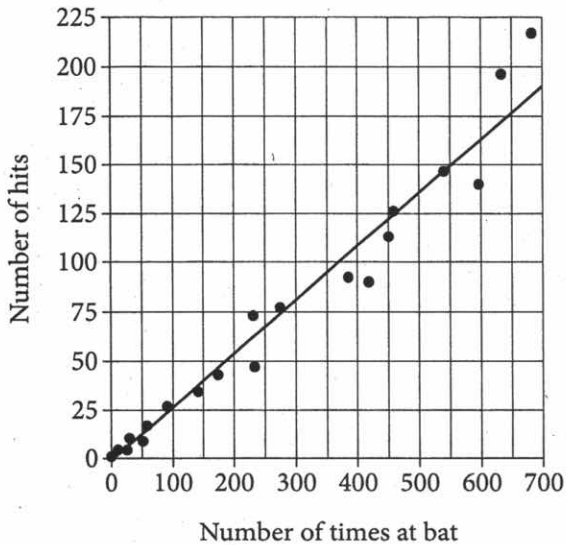
When the equation  $y = 5x + p$ , where  $p$  is a constant, is graphed in the  $xy$ -plane, the line passes through the point  $(-2, 1)$ . What is the value of  $p$ ?

- A) -9
- B) -2
- C) 3
- D) 11



Questions 5 and 6 refer to the following information.

The Number of Hits  
and Times at Bat by Players on  
a Major League Baseball Team



The scatterplot above shows the number of hits and the number of times at bat by each of 20 players on a major league baseball team. The line of best fit for the data is also shown.

5

Which of the following statements about the relationship between the number of times at bat and the number of hits is true?

- A) As the number of times at bat increases, the number of hits decreases.
- B) As the number of times at bat increases, the number of hits increases.
- C) As the number of times at bat increases, the number of hits remains constant.
- D) As the number of times at bat decreases, the number of hits increases.

6

For the player with 450 times at bat, the actual number of hits the player had is approximately how many fewer than the number of hits predicted by the line of best fit?

- A) 10
- B) 20
- C) 30
- D) 40



7

An advertisement states that the printing rate of a certain printer is 400 characters per second. According to the convention that 1 word consists of 5 characters, what would be the advertised printing rate, in words per minute?

- A) 2,000
- B) 4,800
- C) 24,000
- D) 120,000

8

Year	0	1	2	3	4
Salary	38,000	39,140	40,314	41,524	42,769

The table above shows the yearly salary, in dollars, of an employee at a company. Which of the following best describes the type of model that fits the data in the table?

- A) Linear, increasing by approximately \$1,140 per year
- B) Linear, increasing by approximately \$1,245 per year
- C) Exponential, increasing by approximately 3% each year
- D) Exponential, increasing by approximately 9% each year

9

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

Which of the following is equivalent to the expression above?

- A)  $2x^2y + 2xy^2$
- B)  $8xy^2 - 6y^2$
- C)  $2x^2y + 8xy^2 - 6y^2$
- D)  $x^4y^2 + 9xy^4 - 15xy^2$

10

$$4x - \frac{1}{2}x - 7 = 7\left(\frac{1}{2}x - 7\right)$$

Which of the following describes the solution to the equation above?

- A)  $x = 0$
- B)  $x = 10\frac{1}{2}$
- C) The equation has infinitely many solutions.
- D) The equation has no solutions.



11

The table below shows the monthly electricity bills of Joseph and Samuel for the first five months of a year.

Electricity Bills

Month	Joseph	Samuel
January	\$184.66	\$188.99
February	\$193.12	\$181.27
March	\$175.99	\$176.35
April	\$145.30	\$149.23
May	\$180.33	\$185.66

Based on the information in the table, which of these statements is true about the ranges and medians of the bills?

- A) Both the range and median of Joseph's bills are less than the range and median of Samuel's bills.
- B) Both the range and median of Joseph's bills are greater than the range and median of Samuel's bills.
- C) The range of Joseph's bills is less than the range of Samuel's bills, while the median of Joseph's bills is greater than the median of Samuel's bills.
- D) The range of Joseph's bills is greater than the range of Samuel's bills, while the median of Joseph's bills is less than the median of Samuel's bills.

12

Cars in Service on a Railroad

	In service less than 10 years	In service 10 or more years
Single level	215	497
Double-decker	16	82

The table above presents information about the 810 train cars in service on a railroad. Approximately what percentage of the train cars in service are double-decker cars that have been in service for less than 10 years?

- A) 2 percent
- B) 7 percent
- C) 10 percent
- D) 16 percent





13

A moving company uses plastic wrap to bundle groups of boxes together. If a portion of plastic wrap that measures 900 inches in length is used to bundle each group of boxes, how many groups of boxes can be bundled using 1,500 feet of the same type of plastic wrap?

- A) 15
- B) 20
- C) 25
- D) 30

14

The table below shows the number of calories in a cheeseburger at six different restaurants.

Calories in a Cheeseburger

Restaurant	Calories
Blue Jay	810
Clear Lake Cafe	900
Molly's	740
Riverside Diner	1,120
Maya's Bistro	1,050
Tom's Place	700

What is 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?

- A) 190
- B) 233
- C) 265
- D) 390

15

A circle is graphed in the  $xy$ -plane. If the circle has a radius of 3 and the center of the circle is at  $(4, -2)$ , which of the following could be an equation of the circle?

- A)  $(x + 4)^2 + (y - 2)^2 = 3$
- B)  $(x + 4)^2 - (y - 2)^2 = 3$
- C)  $(x - 4)^2 + (y + 2)^2 = 9$
- D)  $(x - 4)^2 - (y + 2)^2 = 9$



Questions 16-18 refer to the following information.

A high school developed a program called Propel, which offers extra guidance and support during the 9th-grade year. Before the school year began, 327 rising 9th graders were selected at random to participate in a study; 109 of those students were randomly assigned to enroll in the Propel program and the remaining students served as a control group. A summary of the year-end grade point averages (GPA) for the 327 9th-grade students who were chosen for the study is shown in the table below.

GPA for the 327 9th-Grade Students

GPA	Enrolled in Propel	Not enrolled in Propel
3.0 or greater	61	95
Less than 3.0	48	123

16

If a 9th-grade student at the high school is chosen at random, which of the following is closest to the probability that the student will have a GPA of 3.0 or greater?

- A) 0.64
- B) 0.48
- C) 0.33
- D) 0.19

17

What is 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?

- A) 4%
- B) 8%
- C) 10%
- D) 12%

18

Of the students enrolled in the Propel program, the ratio of boys to girls is approximately 2:3. Which of the following is the best estimate of the number of girls enrolled in the program?

- A) 44
- B) 65
- C) 73
- D) 131



19

An artist is creating a sculpture using bendable metal rods of equal length. One rod is formed into the shape of a square and another rod into the shape of an equilateral triangle. If each side of the triangle is 2 inches longer than each side of the square, how long, in inches, is each rod?

- A) 16
- B) 18
- C) 24
- D) 30

20

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

A rational function is defined above. Which of the following is an equivalent form that displays values not included in the domain as constants or coefficients?

- A)  $f(x) = \frac{x - 2}{x^2 + x - 2}$
- B)  $f(x) = \frac{2(x - 2)}{2(x + 2)(x - 1)}$
- C)  $f(x) = \frac{1}{x + 1}$
- D)  $f(x) = \frac{1}{2x^2}$

21

A landscaper is designing a rectangular fountain with a 4-foot-wide path around it. The equation  $A = 4p + 64$  will relate the area  $A$ , in square feet, of the path to the perimeter  $p$ , in feet, of the fountain. In the design, how many feet will the perimeter of the fountain increase for each additional square foot of the path's area?

- A)  $\frac{1}{64}$
- B)  $\frac{1}{4}$
- C) 4
- D) 64



22

In the  $xy$ -plane the graph of the function  $q$  is a parabola. The graph intersects the  $x$ -axis at  $(-1, 0)$  and  $(r, 0)$ . If the vertex of  $q$  occurs at the point  $(2, 4)$ , what is the value of  $r$ ?

- A) 0
- B) 3
- C) 4
- D) 5

23

Liquid going through a cooling system is chilled so that its temperature decreases at a constant rate from  $100^\circ\text{C}$  to  $25^\circ\text{C}$  in 5 seconds. Which of the following functions represents the temperature  $C$ , in degrees Celsius, as a function of the time  $t$ , in seconds, after chilling began, for  $0 \leq t \leq 5$ ?

- A)  $C = -25 + 15t$
- B)  $C = 25 - 15t$
- C)  $C = 25 + 15t$
- D)  $C = 100 - 15t$

24

$$V = \frac{4}{3}\pi r^3$$

The formula for the volume of a sphere with radius  $r$  is shown above. The radius of the planet Jupiter is about 11 times the radius of planet Earth. Assuming that planets are spheres, about how many times larger is the volume of Jupiter than the volume of Earth?

- A) 11
- B) 121
- C) 1,331
- D) 1,775



25

The population of squirrels in a park has been doubling every 15 years. Which of the following statements describes the type of function that best models the relationship between the population of squirrels in the park and the number of 15-year time periods?

- A) Exponential growth, because the population of squirrels is increasing by the same amount each 15-year time period
- B) Exponential growth, because the population of squirrels is increasing by the same percentage each 15-year time period
- C) Linear growth, because the population of squirrels is increasing by the same amount each 15-year time period
- D) Linear growth, because the population of squirrels is increasing by the same percentage each 15-year time period

26

If function  $f$  is defined by  $f(x) = 3x^2 - 5x + 4$ , what is  $f(x - 4)$ ?

- A)  $f(x - 4) = 3x^2 - 5x$
- B)  $f(x - 4) = 3x^2 - 5x + 72$
- C)  $f(x - 4) = 3x^2 - 29x + 52$
- D)  $f(x - 4) = 3x^2 - 29x + 72$

27

$$x = \frac{1}{3}y$$
$$154 - 4y = 10x$$

The equations of two lines are shown above. If the lines are graphed in the  $xy$ -plane, which of the following ordered pairs represents the point at which the lines would intersect?

- A) (1, 3)
- B) (3, 9)
- C) (5, 15)
- D) (7, 21)

**DIRECTIONS**

For questions 28-31, solve the problem and enter your answer in the grid, as described below, on the answer sheet.

- Although not required, it is suggested that you write your answer in the boxes at the top of the columns to help you fill in the circles accurately. You will receive credit only if the circles are filled in correctly.
- Mark no more than one circle in any column.
- No question has a negative answer.
- Some problems may have more than one correct answer. In such cases, grid only one answer.
- Mixed numbers** such as  $3\frac{1}{2}$  must be gridded as 3.5 or  $7/2$ . (If  $\begin{array}{|c|c|c|c|} \hline 3 & 1 & / & 2 \\ \hline \bullet & \bullet & \bullet & \bullet \\ \hline \end{array}$  is entered into the grid, it will be interpreted as  $\frac{31}{2}$ , not  $3\frac{1}{2}$ .)
- Decimal answers:** If you obtain a decimal answer with more digits than the grid can accommodate, it may be either rounded or truncated, but it must fill the entire grid.

Write answer in boxes. →

← Fraction line

← Decimal point

Grid in result.

Answer: $\frac{7}{12}$				Answer: 2.5			
7	/	1	2	2	.	5	
●	●	●	●	●	●	●	●
0	0	0	0	0	0	0	0
①	①	●	①	①	①	①	①
②	②	②	●	②	●	②	②
③	③	③	③	③	③	③	③
④	④	④	④	④	④	④	④
⑤	⑤	⑤	⑤	⑤	⑤	⑤	●
⑥	⑥	⑥	⑥	⑥	⑥	⑥	⑥
●	⑦	⑦	⑦	⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨	⑨	⑨	⑨	⑨

Acceptable ways to grid  $\frac{2}{3}$  are:

2	/	3	.	6	6	6	.	6	6	7
●	●	●	●	●	●	●	●	●	●	●
0	0	0	0	0	0	0	0	0	0	
①	①	①	①	①	①	①	①	①	①	
②	●	②	②	②	②	②	②	②	②	
③	③	③	③	③	③	③	③	③	③	
④	④	④	④	④	④	④	④	④	④	
⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	⑤	
⑥	⑥	⑥	⑥	●	●	⑥	●	●	⑥	
⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	⑦	●	
⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	⑧	

Answer: 201 – either position is correct

2	0	1	2	0	1
●	●	●	●	●	●
0	●	0	0	●	0
①	①	①	①	①	①
②	●	②	●	②	②
③	③	③	③	③	③

**NOTE:** You may start your answers in any column, space permitting. Columns you don't need to use should be left blank.



28

Type of meal	Fat (g)	Carbohydrates (g)
Stir-fry	4	40
Szechuan chicken	5	35

A grocer carries two types of frozen meals that have the fat and carbohydrate content shown in the table above. John wants to purchase a combination of the two types of meals with no more than 350 grams of fat and no more than 2975 grams of carbohydrates. If John purchases 10 Szechuan chicken meals, what is the greatest number of stir-fry meals he can purchase so that the combination will satisfy the requirements?

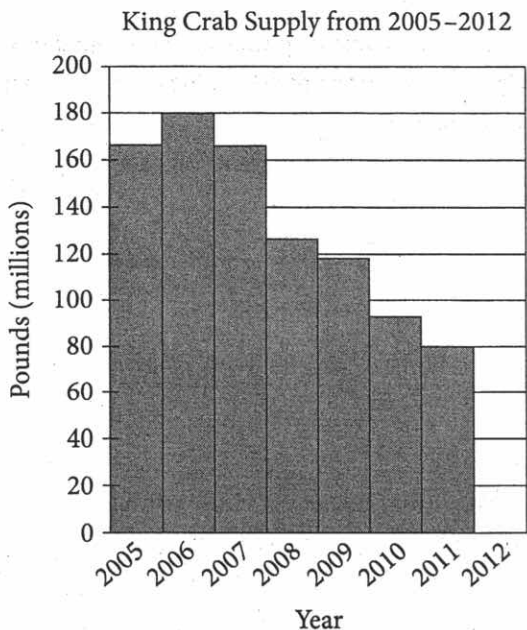
29

$$y = x^2 - 4x + 3$$
$$y = x - 1$$

If  $(x, y)$  is a solution to the system of equations above, what is one possible value of the product of  $x$  and  $y$ ?



Questions 30 and 31 refer to the following information.



The graph above shows the supply, in millions of pounds, of king crab harvested and sold from 2005 to 2011. The information for the year 2012 is not included in the graph.

30

In 2006, the price of king crab was \$8 per pound at the beginning of the year and dropped to \$7 per pound toward the end of the year. If 60% of the king crab supply was sold at the higher price per pound and the rest was sold at the lower price per pound, what was the total revenue generated, in millions of dollars, from the sales of king crab in 2006? (Disregard the \$ when gridding your answer.)

31

In 2011, the price of king crab was \$17 per pound. In 2012,  $x$  million pounds of king crab were sold at \$16 per pound. If the total money generated from sales each year was the same, what is the value of  $x$ ?

**STOP**

**If you finish before time is called, you may check your work on this section only.**

**Do not turn to any other section.**



## Resources to Help You Prepare

The College Board is committed to offering the best practice — free, to the world — and to do so, we partnered with Khan Academy® to help propel students to success. When you upload your answers to this practice test to the Khan Academy engine, we can offer you individualized instruction in the areas you need most. Learn more at [collegeboard.org/psatscoring](http://collegeboard.org/psatscoring).

When you take the PSAT/NMSQT in fall 2016, you will have a good idea of what you will see on the SAT. Be sure to start using the resources available to you through your online score report at [studentscores.collegeboard.org](http://studentscores.collegeboard.org) and find out how to use your PSAT/NMSQT results to power your study at [satpractice.org](http://satpractice.org).

The contents of the PSAT/NMSQT and SAT are not a mystery. You can prepare by visiting [sat.org](http://sat.org) to learn more about the tests.

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When you take the PSAT/NMSQT, you will receive an Evidence-Based Reading and Writing score and a Math score; you will also receive a Selection Index, which National Merit Scholarship Corporation uses in its National Merit® Scholarship Program. The Selection Index is calculated by doubling the sum of the Reading, Writing and Language, and Math Test scores. For example, assuming that your Reading score is 22, your Writing and Language score is 24, and your Math score is 28.5, your Selection Index would be 149.  $[2(22 + 24 + 28.5)]$

## Make the best use of your practice test.

Practice makes a difference! Take the full-length test on the preceding pages, then find detailed instructions on how to score the test at [collegeboard.org/psatpractice](http://collegeboard.org/psatpractice). You'll also find comprehensive answer explanations and a link to Official SAT Practice on Khan Academy.

**Correct Answers** Black letter after answer indicates difficulty level (e = easy, m = medium, h = hard).

READING TEST													
1. A e	8. A e	15. C h	22. D e	29. D h	36. C h	43. A m	2. B m	9. D m	16. B m	23. B m	30. B h	37. B h	44. A e
3. B m	10. A m	17. D e	24. D m	31. D h	38. C m	45. A m	4. B e	11. D e	18. B e	25. C m	32. A h	39. C m	46. D m
5. C m	12. D e	19. A m	26. B m	33. C h	40. C h	47. C m	6. D h	13. D h	20. C m	27. B m	34. A e	41. B m	
7. B h	14. A m	21. B m	28. A m	35. A m	42. B m								
WRITING AND LANGUAGE TEST													
1. D e	8. B m	15. D h	22. A e	29. D h	36. B m	43. C e	2. B e	9. A m	16. B m	23. C h	30. C h	37. C m	44. B h
3. C h	10. D m	17. B m	24. D m	31. D m	38. A m		4. C m	11. D e	18. A m	25. C m	32. B m	39. C h	
5. B m	12. B h	19. B m	26. A m	33. D h	40. D h		6. B h	13. C e	20. C m	27. A m	34. D m	41. D h	
7. A m	14. C e	21. A e	28. B m	35. D h	42. A h								
MATH TEST – NO CALCULATOR													
1. D m	4. C m	7. A m	10. D m	13. B h	16. 1 h		2. A e	5. C m	8. B m	11. A h	14. 2 m	17. 0 h	
3. B m	6. B m	9. C m	12. C h	15. 90 h									
MATH TEST – CALCULATOR													
1. B e	6. A m	11. D m	16. B m	21. B h	26. D h	31. 85 h	2. A e	7. B m	12. A m	17. D h	22. D h	27. D h	
3. B e	8. C m	13. B m	18. B h	23. D h	28. 65 h		4. D m	9. A m	14. C m	19. C m	24. C m	29. 0,12 h	
5. B e	10. D m	15. C m	20. B h	25. B h	30. 1368 h								

5LPT01

# PSAT/NMSQT®

Preliminary SAT/National Merit Scholarship Qualifying Test

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# Answer Explanations for Practice Test #2

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5LPT01

# 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.

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KEY: A

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DIFFICULTY: Easy

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### 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.

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KEY: B

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DIFFICULTY: Medium

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### 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

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KEY: B

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DIFFICULTY: Medium

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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.

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KEY: B

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DIFFICULTY: Easy

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#### 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.

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KEY: C

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DIFFICULTY: Medium

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#### 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

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KEY: D

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DIFFICULTY: Hard

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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.

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KEY: B

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DIFFICULTY: Hard

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### 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.

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KEY: A

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DIFFICULTY: Easy

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### 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.

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KEY: D

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DIFFICULTY: Medium

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**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.

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**KEY:** A

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**DIFFICULTY:** Medium

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**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”).

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**KEY:** D

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**DIFFICULTY:** Easy

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**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

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**KEY:** D

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**DIFFICULTY:** Easy

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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.

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KEY: D

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DIFFICULTY: Hard

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### 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).

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KEY: A

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DIFFICULTY: Medium

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### 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.”

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KEY: C

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DIFFICULTY: Hard

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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.

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**KEY:** B

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**DIFFICULTY:** Medium

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### 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.

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**KEY:** D

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**DIFFICULTY:** Easy

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### 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.

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**KEY:** B

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**DIFFICULTY:** Easy

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**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.

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**KEY: A**

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**DIFFICULTY: Medium**

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**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.

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**KEY: C**

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**DIFFICULTY: Medium**

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**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

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**KEY: B**

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**DIFFICULTY: Medium**

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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.

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**KEY:** D

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**DIFFICULTY:** Easy

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### 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.

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**KEY:** B

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**DIFFICULTY:** Medium

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### 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.

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**KEY:** D

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**DIFFICULTY:** Medium

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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.

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KEY: C

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DIFFICULTY: Medium

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### 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.

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KEY: B

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DIFFICULTY: Medium

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### 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).

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KEY: B

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DIFFICULTY: Medium

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**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.

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KEY: A

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DIFFICULTY: Medium

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**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.

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KEY: D

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DIFFICULTY: Hard

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**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

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KEY: B

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DIFFICULTY: Hard

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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.

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KEY: D

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DIFFICULTY: Hard

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### 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.

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KEY: A

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DIFFICULTY: Hard

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### 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

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KEY: C

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DIFFICULTY: Hard

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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.

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KEY: A

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DIFFICULTY: Easy

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### 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.

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KEY: A

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DIFFICULTY: Medium

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### 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).

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KEY: C

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DIFFICULTY: Hard

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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.

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KEY: B

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DIFFICULTY: Hard

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### 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).

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KEY: C

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DIFFICULTY: Medium

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### 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

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KEY: C

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DIFFICULTY: Medium

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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

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KEY: C

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DIFFICULTY: Hard

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KEY: B

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DIFFICULTY: Medium

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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.

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**KEY:** B

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**DIFFICULTY:** Medium

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### 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.

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**KEY:** A

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**DIFFICULTY:** Medium

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### 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.

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**KEY:** A

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**DIFFICULTY:** Easy

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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.

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KEY: A

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DIFFICULTY: Medium

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### 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.

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KEY: D

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DIFFICULTY: Medium

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### 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).

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KEY: C

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DIFFICULTY: Medium

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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”).

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**KEY:** D

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**DIFFICULTY:** Easy

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#### 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.

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**KEY:** B

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**DIFFICULTY:** Easy

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#### 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.

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**KEY:** C

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**DIFFICULTY:** Hard

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#### 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

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**KEY:** C

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**DIFFICULTY:** Medium

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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.

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KEY: B

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DIFFICULTY: Medium

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### 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.

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KEY: B

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DIFFICULTY: Hard

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### 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.

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KEY: A

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DIFFICULTY: Medium

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### 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.

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KEY: B

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DIFFICULTY: Medium

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**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.

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KEY: A

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DIFFICULTY: Medium

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**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.

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KEY: D

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DIFFICULTY: Medium

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**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.

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KEY: D

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DIFFICULTY: Easy

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**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.

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KEY: B

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DIFFICULTY: Hard

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**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”).

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KEY: C

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DIFFICULTY: Easy

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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.

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**KEY:** C

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**DIFFICULTY:** Easy

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### 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.”

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**KEY:** D

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**DIFFICULTY:** Hard

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### 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.”

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**KEY:** B

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**DIFFICULTY:** Medium

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### 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.

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**KEY:** B

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**DIFFICULTY:** Medium

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### 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).

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**KEY:** A

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**DIFFICULTY:** Medium

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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.

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KEY: B

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DIFFICULTY: Medium

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### 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.

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KEY: C

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DIFFICULTY: Medium

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### 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.

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KEY: A

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DIFFICULTY: Easy

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### 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.

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KEY: A

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DIFFICULTY: Easy

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### 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.

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KEY: C

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DIFFICULTY: Hard

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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.

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KEY: D

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DIFFICULTY: Medium

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### 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.

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KEY: C

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DIFFICULTY: Medium

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### 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.

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KEY: A

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DIFFICULTY: Medium

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### 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.

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KEY: A

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DIFFICULTY: Medium

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### 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.

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KEY: B

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DIFFICULTY: Medium

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**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.

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**KEY:** D

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**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.

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**KEY:** C

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**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.

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**KEY:** D

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**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.

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**KEY:** B

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**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.

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**KEY:** D

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**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.

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**KEY:** D

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**DIFFICULTY:** Medium

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**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.”

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**KEY:** D

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**DIFFICULTY:** Hard

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**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.

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**KEY:** B

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**DIFFICULTY:** Medium

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**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.”

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**KEY:** C

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**DIFFICULTY:** Medium

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**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.

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KEY: A

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DIFFICULTY: Medium

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**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.”

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KEY: C

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DIFFICULTY: Hard

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**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.

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KEY: D

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DIFFICULTY: Hard

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**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” of “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.”

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KEY: D

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DIFFICULTY: Hard

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**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

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KEY: A

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DIFFICULTY: Hard

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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.

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**KEY:** C

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**DIFFICULTY:** Easy

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**KEY:** B

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**DIFFICULTY:** Hard

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## 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.

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**KEY:** D

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**DIFFICULTY:** Medium

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No Calculator

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### 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.

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**KEY:** A

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**DIFFICULTY:** Easy

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No Calculator

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### 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.

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**KEY:** B

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**DIFFICULTY:** Medium

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No Calculator

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### 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.

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**KEY:** C

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**DIFFICULTY:** Medium

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No Calculator

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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

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**KEY:** C

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**DIFFICULTY:** Medium

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No Calculator

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**KEY:** B

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**DIFFICULTY:** Medium

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No Calculator

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**KEY:** A

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**DIFFICULTY:** Medium

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No Calculator

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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

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**KEY:** B

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**DIFFICULTY:** Medium

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No Calculator

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**KEY:** C

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**DIFFICULTY:** Medium

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No Calculator

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**KEY:** D

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**DIFFICULTY:** Medium

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No Calculator

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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  $28^\circ$ , 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  $28^\circ$  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.

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**KEY:** A

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**DIFFICULTY:** Hard

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No Calculator

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### 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

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**KEY:** C

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**DIFFICULTY:** Hard

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No Calculator

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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  $2x = 2(45) = 90$ .

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**KEY:** B

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**DIFFICULTY:** Hard

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No Calculator

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**KEY:** 2

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**DIFFICULTY:** Medium

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No Calculator

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**KEY:** 90

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**DIFFICULTY:** Hard

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No Calculator

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**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  $a = 3(-5) + 4(4) = 1$ .

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**KEY:** 1

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**DIFFICULTY:** Hard

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No Calculator

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**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.

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**KEY:** 0

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**DIFFICULTY:** Hard

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No Calculator

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## 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.

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**KEY:** B

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**DIFFICULTY:** Easy

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Calculator

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### 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.

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**KEY:** A

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**DIFFICULTY:** Easy

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Calculator

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### 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.

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**KEY:** B

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**DIFFICULTY:** Easy

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Calculator

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**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.

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KEY: D

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DIFFICULTY: Medium

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Calculator

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**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.

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KEY: B

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DIFFICULTY: Easy

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Calculator

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**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.

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KEY: A

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DIFFICULTY: Medium

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Calculator

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**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  $400 \times 60$ , 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.

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KEY: B

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DIFFICULTY: Medium

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Calculator

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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.

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KEY: C

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DIFFICULTY: Medium

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Calculator

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**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,  $\$181.27$ .

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**KEY:** A

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**DIFFICULTY:** Medium

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Calculator

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**KEY:** D

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**DIFFICULTY:** Medium

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Calculator

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**KEY:** D

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**DIFFICULTY:** Medium

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Calculator

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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

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**KEY:** A

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**DIFFICULTY:** Medium

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Calculator

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**KEY:** B

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**DIFFICULTY:** Medium

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Calculator

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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.

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**KEY:** C

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**DIFFICULTY:** Medium

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Calculator

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**KEY:** C

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**DIFFICULTY:** Medium

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Calculator

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**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

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**KEY:** B

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**DIFFICULTY:** Medium

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Calculator

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**KEY:** D

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**DIFFICULTY:** Hard

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Calculator

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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.

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**KEY:** B

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**DIFFICULTY:** Hard

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Calculator

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**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

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

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**KEY:** C

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**DIFFICULTY:** Medium

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Calculator

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**KEY:** B

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**DIFFICULTY:** Hard

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Calculator

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**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  $100^\circ\text{C}$ . 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  $100^\circ\text{C}$  to  $25^\circ\text{C}$ . 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  $100^\circ\text{C}$  to  $25^\circ\text{C}$ , or  $75^\circ\text{C}$ , in 5 seconds. This is a rate of decrease of  $15^\circ\text{C}$  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.

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**KEY:** B

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**DIFFICULTY:** Hard

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Calculator

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**KEY:** D

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**DIFFICULTY:** Hard

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Calculator

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**KEY:** D

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**DIFFICULTY:** Hard

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Calculator

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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.

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**KEY:** C

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**DIFFICULTY:** Medium

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Calculator

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**KEY:** B

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**DIFFICULTY:** Hard

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Calculator

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**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  $(7, 21)$ .

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**KEY:** D

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**DIFFICULTY:** Hard

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 Calculator
 

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**KEY:** D

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**DIFFICULTY:** Hard

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 Calculator
 

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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.

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KEY: 65

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DIFFICULTY: Hard

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Calculator

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### 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.

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KEY: 0, 12

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DIFFICULTY: Hard

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Calculator

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**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  $(108)(8) + (72)(7) = 1368$ .

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**KEY:** 1368

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**DIFFICULTY:** Hard

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Calculator

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**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  $x = 85$ .

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**KEY:** 85

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**DIFFICULTY:** Hard

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Calculator

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# Scoring Your PSAT/NMSQT<sup>®</sup> Practice Test #2

Congratulations on completing a PSAT/NMSQT<sup>®</sup> practice test. To score your test, use these instructions and the conversion tables and answer key at the end of this document.

## Scores Overview

The redesigned PSAT/NMSQT will provide more information about your learning by reporting more scores than ever before. Each of the redesigned assessments (SAT<sup>®</sup>, PSAT/NMSQT, PSAT<sup>™</sup> 10, and PSAT<sup>™</sup> 8/9) will report test scores and cross-test scores on a common scale. Additionally, subscores will be reported to provide additional diagnostic information to students, educators, and parents. For more details about scores, visit [collegereadiness.collegeboard.org](http://collegereadiness.collegeboard.org).

The practice test you completed was written by the College Board's Assessment Design & Development team using the same processes and review standards used when writing the actual PSAT/NMSQT. Everything from the layout of the page to the construction of the questions accurately reflects what you'll see on test day.

## How to Calculate Your Practice Test Scores

### GET SET UP

- 1 You'll need the answer sheet that you bubbled in while taking the practice test. You'll also need the conversion tables and answer key at the end of this document.
- 2 Using the answer key, count up your total correct answers for each section. You may want to write the number of correct answers for each section at the bottom of that section in the answer key.
- 3 Using your marked-up answer key and the conversion tables, follow the directions to get all of your scores.

# GET SECTION AND TOTAL SCORES

Your total score on the PSAT/NMSQT practice test is the sum of your Evidence-Based Reading and Writing Section score and your Math Section score. To get your total score, you will convert what we call the “raw score” for each section — the number of questions you got right in that section — into the “scaled score” for that section, then calculate the total score.

## GET YOUR EVIDENCE-BASED READING AND WRITING SECTION SCORE

Calculate your PSAT/NMSQT Evidence-Based Reading and Writing Section score (it’s on a scale of 160–760) by first determining your Reading Test score and your Writing and Language Test score. Here’s how:

- 1 Count the number of correct answers you got on Section 1 (the Reading Test). There is no penalty for wrong answers. The number of correct answers is your raw score.
- 2 Go to Raw Score Conversion Table 1: Section and Test Scores on page 7. Look in the “Raw Score” column for your raw score, and match it to the number in the “Reading Test Score” column.
- 3 Do the same with Section 2 to determine your Writing and Language Test score.
- 4 Add your Reading Test score to your Writing and Language Test score.
- 5 Multiply that number by 10. This is your Evidence-Based Reading and Writing Section score.

**EXAMPLE:** *Jennifer answered 29 of the 47 questions correctly on the PSAT/NMSQT Reading Test and 20 of the 44 questions correctly on the PSAT/NMSQT Writing and Language Test. Using the table on page 7, she calculates that she received a PSAT/NMSQT Reading Test score of 28 and a PSAT/NMSQT Writing and Language Test score of 22. She adds 28 to 22 (gets 50) and then multiplies by 10 to determine her PSAT/NMSQT Evidence-Based Reading and Writing Section score of 500.*

## GET YOUR MATH SECTION SCORE

Calculate your PSAT/NMSQT Math Section score (it’s on a scale of 160–760).

- 1 Count the number of correct answers you got on Section 3 (Math Test — No Calculator) and Section 4 (Math Test — Calculator). There is no penalty for wrong answers.
- 2 Add the number of correct answers you got on Section 3 (Math Test — No Calculator) and Section 4 (Math Test — Calculator).
- 3 Use Raw Score Conversion Table 1: Section and Test Scores to turn your raw score into your Math Section score.

## GET YOUR TOTAL SCORE

Add your Evidence-Based Reading and Writing Section score to your Math Section score. The result is your total score on the PSAT/NMSQT Practice Test, on a scale of 320–1520.

# GET SUBSCORES

Subscores provide more detailed information about your strengths in specific areas within literacy and math. They are reported on a scale of 1–15.

## HEART OF ALGEBRA

The Heart of Algebra subscore is based on questions from the Math Test that focus on linear equations and inequalities.

1 Add up your total correct answers from the following set of questions:

- ▶ Math Test – No Calculator: Questions 5-10; 14-15
- ▶ Math Test – Calculator: Questions 2; 4; 10; 19; 21; 23; 27-28

Your total correct answers from all of these questions is your raw score.

2 Use Raw Score Conversion Table 2: Subscores on page 8 to determine your Heart of Algebra subscore.

## PROBLEM SOLVING AND DATA ANALYSIS

The Problem Solving and Data Analysis subscore is based on questions from the Math Test that focus on quantitative reasoning, the interpretation and synthesis of data, and solving problems in rich and varied contexts.

1 Add up your total correct answers from the following set of questions:

- ▶ Math Test – No Calculator: No Questions
- ▶ Math Test – Calculator: Questions 1; 3; 5-8; 11-14; 16-18; 25; 30-31

Your total correct answers from all of these questions is your raw score.

2 Use Raw Score Conversion Table 2: Subscores to determine your Problem Solving and Data Analysis subscore.

## PASSPORT TO ADVANCED MATH

The Passport to Advanced Math subscore is based on questions from the Math Test that focus on topics central to the ability of students to progress to more advanced mathematics, such as understanding the structure of expressions, reasoning with more complex equations, and interpreting and building functions.

1 Add up your total correct answers from the following set of questions:

- ▶ Math Test – No Calculator: Questions 1-4; 12-13; 16-17
- ▶ Math Test – Calculator: Questions 9; 20; 22; 24; 26; 29

Your total correct answers from all of these questions is your raw score.

2 Use Raw Score Conversion Table 2: Subscores to determine your Passport to Advanced Math subscore.

## EXPRESSION OF IDEAS

The Expression of Ideas subscore is based on questions from the Writing and Language Test that focus on topic development, organization, and rhetorically effective use of language.

- 1 Add up your total correct answers from the following set of questions:
  - ▶ Writing and Language Test: Questions 2; 6-9; 11; 15; 18-23; 26-29; 31; 34; 36-37; 40; 43-44Your total correct answers from all of these questions is your raw score.
- 2 Use Raw Score Conversion Table 2: Subscores to determine your Expression of Ideas subscore.

## STANDARD ENGLISH CONVENTIONS

The Standard English Conventions subscore is based on questions from the Writing and Language Test that focus on sentence structure, usage, and punctuation.

- 1 Add up your total correct answers from the following set of questions:
  - ▶ Writing and Language Test: Questions 1; 3-5; 10; 12-14; 16-17; 24-25; 30; 32-33; 35; 38-39; 41-42Your total correct answers from all of these questions is your raw score.
- 2 Use Raw Score Conversion Table 2: Subscores to determine your Standard English Conventions subscore.

## WORDS IN CONTEXT

The Words in Context subscore is based on questions from both the Reading Test and the Writing and Language Test that address word/phrase meaning in context and rhetorical word choice.

- 1 Add up your total correct answers from the following set of questions:
  - ▶ Reading Test: Questions 4; 8-9; 11-12; 24-25; 29; 34; 44
  - ▶ Writing and Language Test: Questions 7; 9; 15; 22-23; 29; 40; 44Your total correct answers from all of these questions is your raw score.
- 2 Use Raw Score Conversion Table 2: Subscores to determine your Words in Context subscore.

## COMMAND OF EVIDENCE

The Command of Evidence subscore is based on questions from both the Reading Test and the Writing and Language Test that ask you to interpret and use evidence found in a wide range of passages and informational graphics, such as graphs, tables, and charts.

- 1 Add up your total correct answers from the following set of questions:
  - ▶ Reading Test: Questions 2; 7; 13; 15; 21; 28; 31; 33; 42; 46
  - ▶ Writing and Language Test: Questions 6; 11; 20-21; 26; 28; 37; 43Your total correct answers from all of these questions is your raw score.
- 2 Use Raw Score Conversion Table 2: Subscores to determine your Command of Evidence subscore.

## GET CROSS-TEST SCORES

The new PSAT/NMSQT also reports two cross-test scores: Analysis in History/Social Studies and Analysis in Science. These scores are based on questions in the Reading, Writing and Language, and Math Tests that ask students to think analytically about texts and questions in these subject areas. Cross-test scores are reported on a scale of 8–38.

### ANALYSIS IN HISTORY/SOCIAL STUDIES

1 Add up your total correct answers from the following set of questions:

- ▶ Reading Test: Questions 10-18; 29-38
- ▶ Writing and Language Test: Questions 2; 6-9; 11
- ▶ Math Test – No Calculator: Questions 10
- ▶ Math Test – Calculator: Questions 11; 16; 18; 30-31

Your total correct answers from all of these questions is your raw score.

2 Use Raw Score Conversion Table 3: Cross-Test Scores on page 9 to determine your Analysis in History/Social Studies cross-test score.

### ANALYSIS IN SCIENCE

1 Add up your total correct answers from the following set of questions:

- ▶ Reading Test: Questions 19-28; 39-47
- ▶ Writing and Language Test: Questions 15; 18-22
- ▶ Math Test – No Calculator: Questions 2; 6
- ▶ Math Test – Calculator: Questions 3; 14; 23-25

Your total correct answers from all of these questions is your raw score.

2 Use Raw Score Conversion Table 3: Cross-Test Scores to determine your Analysis in Science cross-test score.

# PSAT/NMSQT Practice Test #2: Worksheets

## ANSWER KEY

### Reading Test Answers

1 A	11 D	21 B	31 D	41 B
2 B	12 D	22 D	32 A	42 B
3 B	13 D	23 B	33 C	43 A
4 B	14 A	24 D	34 A	44 A
5 C	15 C	25 C	35 A	45 A
6 D	16 B	26 B	36 C	46 D
7 B	17 D	27 B	37 B	47 C
8 A	18 B	28 A	38 C	
9 D	19 A	29 D	39 C	
10 A	20 C	30 B	40 C	

READING TEST  
 RAW SCORE  
 (NUMBER OF  
 CORRECT ANSWERS)

### Writing and Language Test Answers

1 D	11 D	21 A	31 D	41 D
2 B	12 B	22 A	32 B	42 A
3 C	13 C	23 C	33 D	43 C
4 C	14 C	24 D	34 D	44 B
5 B	15 D	25 C	35 D	
6 B	16 B	26 A	36 B	
7 A	17 B	27 A	37 C	
8 B	18 A	28 B	38 A	
9 A	19 B	29 D	39 C	
10 D	20 C	30 C	40 D	

WRITING AND  
 LANGUAGE TEST  
 RAW SCORE  
 (NUMBER OF  
 CORRECT ANSWERS)

### Math Test No Calculator Answers

1 D	11 A
2 A	12 C
3 B	13 B
4 C	14 2
5 C	15 90
6 B	16 1
7 A	17 0
8 B	
9 C	
10 D	

MATH TEST  
 NO CALCULATOR  
 RAW SCORE  
 (NUMBER OF  
 CORRECT ANSWERS)

### Math Test Calculator Answers

1 B	11 D	21 B
2 A	12 A	22 D
3 B	13 B	23 D
4 D	14 C	24 C
5 B	15 C	25 B
6 A	16 B	26 D
7 B	17 D	27 D
8 C	18 B	28 65
9 A	19 C	29 0,12
10 D	20 B	30 1368
		31 85

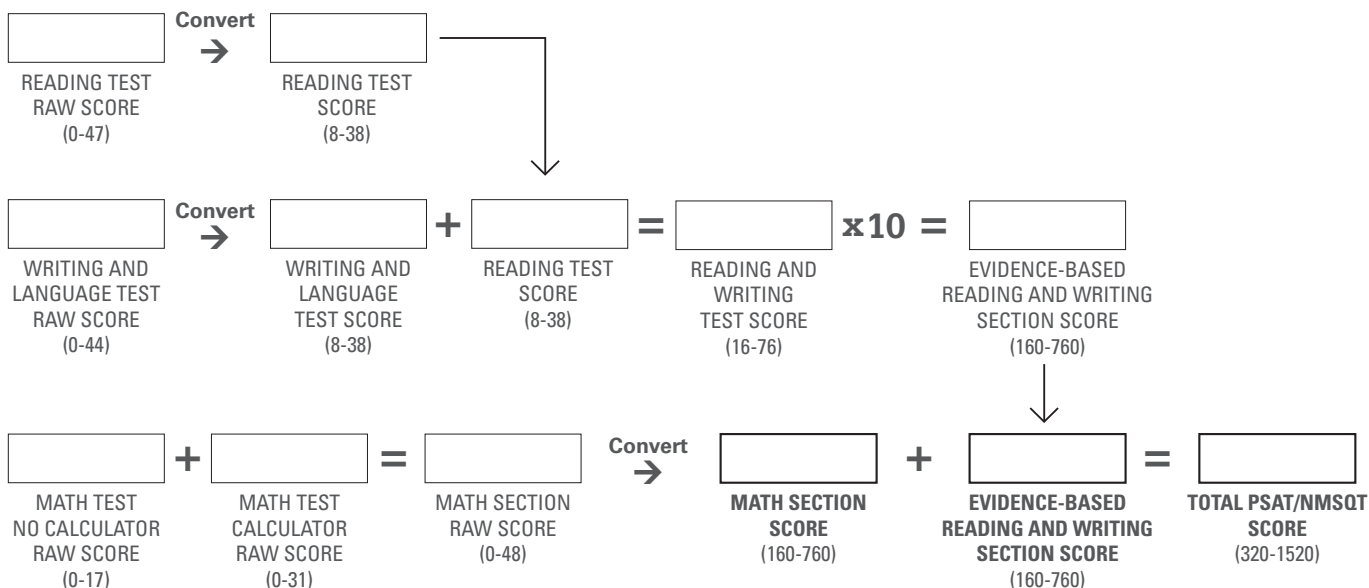
MATH TEST  
 CALCULATOR  
 RAW SCORE  
 (NUMBER OF  
 CORRECT ANSWERS)

# PSAT/NMSQT Practice Test #2: Worksheets

## RAW SCORE CONVERSION TABLE 1 SECTION AND TEST SCORES

Raw Score (# of correct answers)	Reading Test Score	Writing and Language Test Score	Math Section Score	Raw Score (# of correct answers)	Reading Test Score	Writing and Language Test Score	Math Section Score
0	8	8	160	25	25	26	530
1	9	9	190	26	26	26	540
2	10	10	210	27	26	27	540
3	11	11	240	28	27	27	550
4	12	12	260	29	28	28	560
5	13	13	290	30	28	28	570
6	14	13	310	31	29	29	570
7	15	14	320	32	29	29	580
8	16	14	340	33	30	30	590
9	16	15	350	34	31	31	600
10	17	16	370	35	31	31	610
11	17	16	380	36	32	32	620
12	18	17	400	37	32	33	630
13	18	18	410	38	33	33	640
14	19	18	420	39	34	34	650
15	19	19	430	40	34	35	670
16	20	20	440	41	35	36	680
17	21	20	450	42	35	37	700
18	21	21	460	43	36	38	710
19	22	22	470	44	36	38	730
20	22	23	480	45	37		740
21	23	23	490	46	38		740
22	24	24	500	47	38		750
23	24	24	510	48			760
24	25	25	520				

## CONVERSION EQUATION 1 SECTION AND TEST SCORES



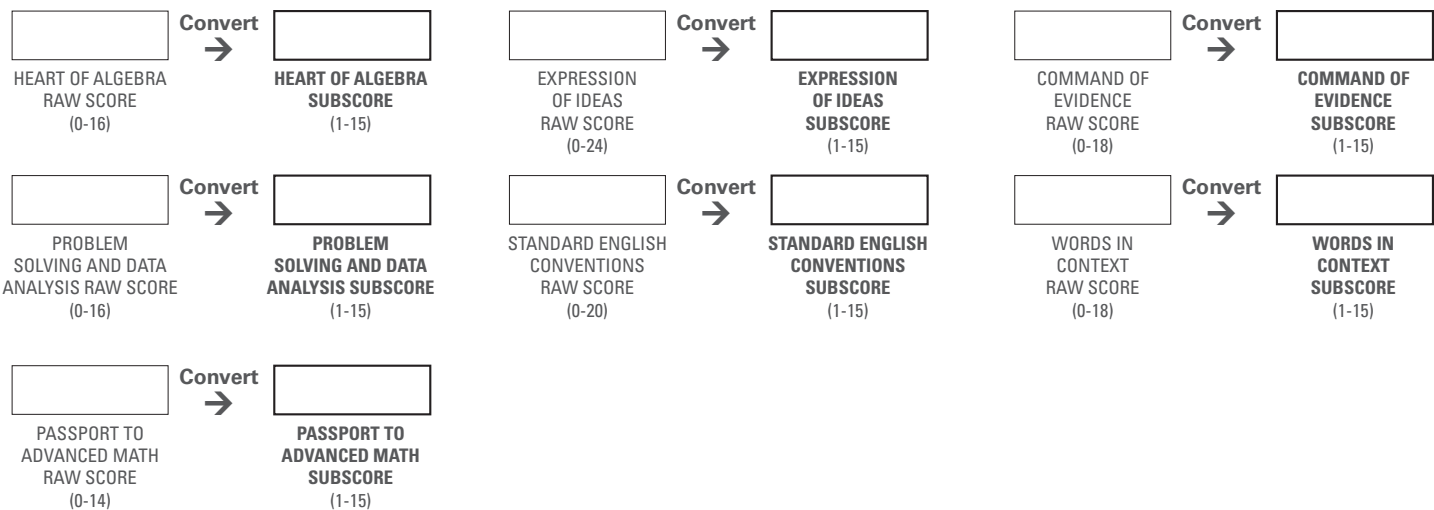


# PSAT/NMSQT Practice Test #2: Worksheets

## RAW SCORE CONVERSION TABLE 2 SUBSCORES

Raw Score (# of correct answers)	Heart of Algebra	Problem Solving and Data Analysis	Passport to Advanced Math	Expression of Ideas	Standard English Conventions	Words in Context	Command of Evidence
0	1	1	1	1	1	1	1
1	3	3	3	2	1	1	3
2	4	4	5	3	2	2	4
3	5	5	6	4	3	3	5
4	6	6	7	4	4	4	5
5	7	7	8	5	5	5	6
6	7	7	9	5	6	5	7
7	8	8	10	6	6	6	7
8	9	9	11	6	7	7	8
9	9	9	12	7	8	8	9
10	10	10	13	7	8	8	9
11	11	10	14	7	9	9	10
12	12	11	15	8	10	10	11
13	13	12	15	8	10	10	11
14	14	13	15	9	11	11	12
15	15	14		9	12	12	13
16	15	15		10	12	13	14
17				10	13	14	15
18				11	14	15	15
19				11	15		
20				12	15		
21				13			
22				14			
23				15			
24				15			

## CONVERSION EQUATION 2 SUBSCORES



# PSAT/NMSQT Practice Test #2: Worksheets

## RAW SCORE CONVERSION TABLE 3 CROSS-TEST SCORES

Raw Score (# of correct answers)	Analysis in History/ Social Studies Cross-Test Score	Analysis in Science Cross-Test Score	Raw Score (# of correct answers)	Analysis in History/ Social Studies Cross-Test Score	Analysis in Science Cross-Test Score
0	8	8	17	26	24
1	10	9	18	27	25
2	11	11	19	28	26
3	13	13	20	28	26
4	14	15	21	29	27
5	15	16	22	30	28
6	16	17	23	31	29
7	17	18	24	31	30
8	18	18	25	32	31
9	19	19	26	33	32
10	20	20	27	34	33
11	21	20	28	35	34
12	22	21	29	36	35
13	22	22	30	37	36
14	23	22	31	37	37
15	24	23	32	38	38
16	25	24			

## CONVERSION EQUATION 3 CROSS-TEST SCORES

Test	Analysis in History/Social Studies		Analysis in Science	
	Questions	Raw Score	Questions	Raw Score
Reading Test	10-18; 29-38		19-28; 39-47	
Writing and Language Test	2; 6-9; 11		15; 18-22	
Math Test No Calculator	10		2; 6	
Math Test Calculator	11; 16; 18; 30-31		3; 14; 23-25	
Total				

