

# Reading Test

65 MINUTES, 52 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 1-10 are based on the following passage.

This passage is adapted from Meg Wolitzer, *The Wife*. Originally published in 2003. The narrator, a student at Smith College, a women's college, is enrolled in a creative writing class in the 1950s.

Line "Write what you know," Professor Castleman  
5 advised as he sent us off to complete the writing assignment.

That night after dinner (shepherd's pie, I remember, for I sat there looking at it and trying to describe it to myself in a writerly fashion, though the best I could come up with was, pathetically, "a roof of  
10 mashed potato spread thickly atop a squat house of meat"), I climbed to the upper reaches of the Neilson Library. On tall steel shelves around me were ancient bound volumes of scientific abstracts: *Annals of Phytochemistry*, Sept.-Nov. 1922; *International  
15 Journal of Haematology*, Jan.-Mar. 1931. I wondered if anyone would ever again open any of these books again, or whether they'd remain shut for eternity, like some spell-fastened door in a fairy tale.

Should I be the one to open them, to plant kisses  
20 on their frail crisp pages and break the spell? Did it make sense to try and write? What if no one ever read what I wrote, what if it languished untouched on the chilled shelf of a college library forever? I sat down at a carrel, looking around at the ignored spines of  
25 books, the lightbulbs suspended in their little cages, and I listened to the distant scrapes of chair legs and the rumble of a lone book cart being rolled along one of the levels of the stacks.

For a while I stayed there and tried to imagine  
30 what it was I actually knew. I'd seen almost nothing of the world; a trip to Rome and Florence with my parents when I was fifteen had been spent in the protection of good hotels and pinned behind the green-glass windows of tour buses, looking at stone  
35 fountains in piazzas from an unreal remove. The level of my experience and knowledge had remained the same, hadn't risen, hadn't overflowed. I'd stood with other Americans, all of us huddled together, heads back and mouths dropped open as we peered up at  
40 painted ceilings. I thought now about how I had never been in love, had never gone to a political meeting in someone's basement, had never really done anything that could be considered independent or particularly insightful or daring. At Smith, girls  
45 surrounded me, the equivalent of those American tourists. Girls in groups were as safe as shepherd's pie.

Now I sat in the upper part of the library, freezing cold but not minding, and finally I made myself begin to write something. Without censoring it or  
50 condemning it for being trivial or narrow or simply poorly constructed, I wrote about the impenetrable wall of femaleness that formed my life. This, apparently, was what I knew. I wrote about the three different perfumes—Chanel No. 5, White Shoulders,  
55 and Joy—that could be smelled everywhere on campus, and about the sound of six hundred female voices rising up together at convocation to sing "Gaudeamus Igitur."

When I was done, I sat for a long time at that  
60 carrel, thinking of Professor J. Castleman and how he'd looked in class with his eyes closed. His eyelids

had a purplish, nearly translucent quality, making them appear inadequate to the task of keeping the world out. Maybe that was what it was like to be a  
65 writer: Even with the eyes closed, you could see.

During his office hours the following week, sitting on the bench in the hallway, I waited with nearly rabid anticipation. Someone was already in there; I could hear the dueling murmurs of a male voice and  
70 a female one, punctuated by an occasional shriek of female hilarity, all of which increased my annoyance. Was there a party going on? Were drinks being served, and damp little sandwiches? Finally the door opened and Abigail Brenner, one of the other  
75 students from the class, emerged, holding her tedious story about her grandmother's recent death from double pneumonia, which she had been reworking pointlessly since the first day of class. From within the office, I could see Castleman at his desk; his jacket  
80 was off, and he was in his shirtsleeves and tie.

"Well, hello there, Miss Ames," he said, finally realizing I was there.

"Hello, Professor Castleman," I said, and I sat across from him on a wooden chair. He held my new  
85 story in his hand, the one I'd left in his department mailbox.

"So. Your story." He looked at it serenely. There were almost no markings on it, no red-pen hieroglyphics. "I've read this twice," he said, "and  
90 frankly, both times I've found it to be wonderful."

1

Which of the following statements best summarizes the passage?

- A) A writer embarks on a search for an audience that understands her work.
- B) A writer demonstrates persistence in overcoming a variety of challenges.
- C) A writer succeeds in conveying her experience in an authentic way.
- D) A writer gradually recognizes her need for intellectual exchanges

2

The narrator indicates that her attempt to think in "a writerly fashion" (line 8) during dinner was

- A) unnecessarily distracting
- B) pitifully inadequate
- C) vastly entertaining
- D) moderately serviceable

3

Based on the passage, which of the following risks that writers may face is a concern to the narrator?

- A) Being misunderstood by readers
- B) Being overlooked by readers
- C) Revealing personal feelings to readers
- D) Choosing a topic that is unappealing to readers

4

Which main effect do the words "ignored," "distant," and "lone" in lines 24-27 have in conveying the mood of the narrator?

- A) They reflect her sense of isolation as a writer.
- B) They hint at her underlying hostility to well-known writers.
- C) They emphasize her lifelong desire to become a writer.
- D) They undercut her claims about the quality of her writing.

5

As used in line 33, "pinned" most nearly means

- A) suspended
- B) displayed
- C) attached
- D) confined

6

The narrator suggests that her college classmates resemble the American tourists in which way?

- A) They are uninterested in the thoughts and reactions of other people.
- B) They are sheltered from exposure to new types of experiences.
- C) They feel overwhelmed by the cultural richness of their surroundings.
- D) They are afraid of traveling to unfamiliar environments.

7

Based on the passage, the "wall" (line 52) is best described as

- A) a protective boundary that insulates the narrator from severe criticism.
- B) a formidable barrier that must be overcome in order for one to succeed.
- C) an ominous presence that alerts writers to the consequences of failure.
- D) an inescapable constraint that encourages students' social conformity.

8

Which choice provides the best evidence that the narrator idealizes Professor Castleman?

- A) Lines 64-65 ("Maybe . . . see")
- B) Lines 78-80 ("From . . . tie")
- C) Line 87 ("He looked . . . serenely")
- D) Lines 89-90 ("I've read . . . wonderful")

9

Based on the passage, the narrator feels indignant while waiting outside Professor Castleman's office primarily because she

- A) believes Professor Castleman is deliberately ignoring her.
- B) objects to Professor Castleman's slowness in grading her work.
- C) resents the apparent frivolity of the meeting going on inside.
- D) disapproves of the topic of Abigail Brenner's story.

10

Which choice provides the best evidence to the previous question?

- A) Lines 66-68 ("During. . . anticipation")
- B) Lines 68-71 ("Someone. . . annoyance")
- C) Lines 73-78 ("Finally . . . of class")
- D) Lines 81-82 ("Well. . . was there")

**Questions 11-20 are based on the following passage.**

This passage is adapted from a speech delivered in 1860 by John Hossack, "Speech of John Hossack, Convicted of a Violation of the Fugitive Slave Law, before Judge Drummond, of the United States District Court, Chicago, IL." Hossack was tried for aiding an escaped African American slave, in violation of the Fugitive Slave Law of 1850.

I am a foreigner. I [was born] among the rugged but free hills of Scotland; a land, Sir, that never was conquered, and where a slave never breathed. Let a slave set foot on that shore, and his chains fall off for  
 5 ever, and he becomes what God made him—a man. In this far-off land, I heard of your free institutions, your prairie lands, your protected canals, and your growing towns. Twenty-two years ago, I landed in this city. . . I then opened a prairie farm to get bread  
 10 for my family, and I am one of the men who have made Chicago what it is to-day, having shipped some of the first grain that was exported from this city. I am, Sir, one of the pioneers of Illinois, who have gone through many of the hardships of the settlement of a  
 15 new country. I have spent upon it my best days, the strength of my manhood. I have eleven children, who are natives of this my adopted country. No living man, Sir, has greater interest in its welfare; and it is because I am opposed to carrying out wicked and  
 20 ungodly laws, and love the freedom of my country, that I stand before you to-day. . .

Sir, I ought not to be sentenced because, as been argued by the prosecution, I am an Abolitionist. I have no apologies to make for being an Abolitionist.  
 25 When I came to this country, like the mass from beyond the sea, I was a Democrat; there was a charm in the name. But Sir, I soon found that I had to go beyond the name of a party in this country, in order to know any thing of its principles or practice. I soon  
 30 found that however much the great parties of my adopted country differed upon banks, tariffs and land questions, in one thing they agreed, in trying which could stoop the lowest to gain the favor of the most cursed system of slavery that ever swayed a iron rod  
 35 over any nation. . . As a man who had fled from the crushing aristocracy of my native land, how could I support a worse aristocracy in this land? I was compelled to give my humble name and influence to a party who proposed, at least, to embrace in its  
 40 sympathies all classes of men, from all quarters of the globe. In this choice, I found myself in the company of Clarkson and Wilberforce<sup>1</sup> in my native land, and of Washington and Franklin, in this boasted land of the free; and more than all these, the Redeemer in  
 45 whom I humbly trust for acceptance with my God, who came to heal the broken-hearted, to preach

deliverance to the captives, to set at liberty those who were bruised. . . Tell me, Sir, with these views, can I be any thing but an Abolitionist? Surely, for this I ought  
 50 not to be sentenced.

Again, sir, I ought not to be sentenced, because the Fugitive Slave Law, under which I am torn from my family and business by the supple tools of the Slave Power<sup>2</sup>. . . is at variance with both the spirit and letter  
 55 of the Constitution. Sir, I place myself upon the Constitution, in the presence of a nation who have the Declaration of Independence read to them every Fourth of July, and profess to believe it. Yes, in the presence of civilized man, I hold up the Constitution  
 60 of my adopted country as clear from the blood of men, and from a tyranny that would make crowned heads blush. The parties who [bend] the Constitution to the support of slavery are traitors—traitors not only to the liberties of millions of enslaved  
 65 countrymen, but traitors to the Constitution itself which they have sworn to support. A foreigner upon your soil, I go not to the platforms of contending parties to find truth. I go, Sir, to the Constitution of my country: the word slave is not to be found. I read,  
 70 "We, the people of the United States, in order to form a more perfect Union, establish justice,"—yes, Sir, establish justice—"to promote the general welfare, and to secure the blessings of liberty to ourselves and our posterity, so ordain and establish this  
 75 Constitution of the United States of America." These were the men who had proclaimed to the world that all men were created equal; that they were endowed by their Creator with certain inalienable rights—life, liberty, and the pursuit of happiness; and contended  
 80 even unto death for seven long years. Can it be, Sir, that these great men, under cover of those hallowed words, intended to make a government that should outrage justice and trample upon liberty as no other government under the whole heavens has ever done?

<sup>1</sup> British abolitionists

<sup>2</sup> The political influence wielded by slave owners

11

The primary purpose of the passage is to convince the presiding judge that

- A) the Fugitive Slave Law is in conflict with various state and local laws.
- B) the Fugitive Slave Law does not apply to foreign-born residents such as Hossack.
- C) Hossack's contributions to his adopted country outweigh the illegality of his actions.
- D) Hossack's actions in service of the abolitionist cause should not be considered crimes.

12

Hossack's descriptions of Scotland in lines 1-5 ("I am. . . man") suggest that

- A) he sought greater freedom than his homeland offered.
- B) the values of his homeland shaped his love of freedom.
- C) his fear of financial insecurity prompted his emigration.
- D) he lacked faith in Scotland's justice system.

13

Hossack's account of his experiences in Chicago in lines 8-15 ("Twenty-two. . . country") primarily serves to

- A) emphasize the extent of his contribution to the United States.
- B) highlight his role in helping boost American exports.
- C) justify his attempts to undermine destructive government policies.
- D) demonstrate that the court is obligated to be lenient toward him.

14

Hossack indicates that upon coming to the United States, he identified with the Democratic Party because it

- A) welcomed newcomers from overseas.
- B) appealed to him for superficial reasons.
- C) reminded him of political parties in Scotland.
- D) maintained flexible positions on certain issues.

15

As used in lines 34-35, the phrase "swayed an iron rod over" serves mainly to characterize the

- A) strength wielded by a single forceful individual.
- B) political influence exerted by a powerful group.
- C) control of weaker nations by a country with more authority.
- D) discrepancy between political ideals and processes.

16

It can be reasonably inferred from the passage that Hossack became an abolitionist because

- A) he had been a part of the successful abolitionist movement in Scotland.
- B) participation in the Democratic Party made him aware of the injustice of slavery.
- C) antislavery activism helped him adjust to his new country.
- D) slavery was another form of an unjust social system that he already opposed.

17

As used in line 58, "profess" most nearly means

- A) claim.
- B) confess.
- C) instruct.
- D) decline.

18

Which choice most clearly suggests that in Hossack's view, those who willfully distort the core principles of the United States should be considered criminals?

- A) Lines 55-58 ("Sir, I . . . believe it")
- B) Lines 58-62 ("Yes, in . . . blush")
- C) Lines 62-66 ("The parties . . . support")
- D) Lines 68-69 ("I go, Sir . . . found")

19

It can most reasonably be inferred from the passage that Hossack regards the authors of the founding documents of the United States to be

- A) well-meaning men who offered proposals that they feared would be difficult to implement.
- B) ambitious men who hoped to change the world with their far-reaching pronouncements.
- C) virtuous men who intended to reflect the actual practice of important ideals.
- D) calculating men who made promises that would benefit them politically.

20

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

- A) Lines 66-68 ("A foreigner . . . truth")
- B) Lines 69-75 ("I read . . . America")
- C) Lines 75-80 ("These . . . years")
- D) Lines 80-84 ("Can . . . done")



**Questions 21-30 are based on the following passage.**

Passage 1 is adapted from "Cloud Seeding' Not Effective at Producing Rain as Once Thought, New Research Shows." ©2010 by American Friends of Tel Aviv University. Passage 2 is adapted from Janet Pelley, "Does Cloud Seeding Really Work?" ©2017 by American Chemical Society.

**Passage 1**

In many areas of the world, including California's Mojave Desert, rain is a precious and rare resource. To encourage rainfall, scientists use "cloud seeding," a weather modification process designed to increase precipitation amounts by dispersing chemicals into the clouds.

But research now reveals that the common practice of cloud seeding with materials such as silver oxide and frozen carbon dioxide may not be as effective as it had been hoped. In the most comprehensive reassessment of the effects of cloud seeding over the past fifty years, new findings from Prof. Pinhas Alpert, Prof. Zev Levin and Dr. Noam Halfon of Tel Aviv University's Department of Geophysics and Planetary Sciences have dispelled the notion that cloud seeding is an effective mechanism for precipitation enhancement.

During the course of his study, Prof. Alpert and his colleagues looked over fifty years' worth of data on cloud seeding, with an emphasis on rainfall amounts in a target area over the Sea of Galilee in the north of Israel. The research team used a comprehensive rainfall database and compared statistics from periods of seeding and non-seeding, as well as amounts of precipitation in the adjacent non-seeded areas.

"By comparing rainfall statistics with periods of seeding, we were able to show that increments of rainfall happened by chance," says Prof. Alpert. "For the first time, we were able to explain the increases in rainfall through changing weather patterns" instead of the use of cloud seeding.

Most notable was a six year period of increased rainfall, originally thought to be a product of successful cloud seeding. Prof. Alpert and his fellow researchers showed that this increase corresponded with a specific type of cyclone which is consistent with increased rainfall over the mountainous regions. They observed a similarly significant rain enhancement over the Judean Mountains, an area which was not the subject of seeding.

**Passage 2**

Last year marked the conclusion of a massive six-year study that has been the most comprehensive and rigorous to date to investigate whether cloud seeding actually increases precipitation. Called the Wyoming Weather Modification Pilot Project (WWMPP), the study was run by a team of researchers from government, academia, and private industry. In the end, WWMPP wasn't able to provide a definitive answer. "But the results do provide a body of evidence that cloud seeding is working under certain conditions," says Roelof Brientjes, an atmospheric scientist at the National Center for Atmospheric Research (NCAR), who was not part of the project although his colleagues at NCAR were deeply involved.

Earlier studies would inject silver iodide into clouds, then compare precipitation gauges in areas inside and outside the seeding zone. But the studies weren't repeatable, and they didn't include enough trials to guarantee that observed increases in precipitation weren't due to chance. The challenge with measuring the effect of weather modification is that natural rain and snowfall variability is 10 to 100 times as large as the amount of precipitation augmented by seeding, Brientjes says.

Still, the WWMPP researchers thought they could address the drawbacks of past studies. The researchers designed their \$14 million project to run for six winter seasons in the mountains of Wyoming. They conducted more than 150 tests, randomly selecting clouds to seed and clouds to be their unseeded controls.

Measurements from the high-resolution snow gauges on the ground indicated that seeding elevated snowfall by 5-15%. But this result was achieved only after the researchers threw out some of the tests where silver iodide drifted into control clouds or where not enough seeding material was released, so the final results weren't statistically significant. "Nevertheless, all the results provided evidence for a positive trend," Brientjes says.

The scientists also took advantage of new developments in remote-sensing and atmospheric modeling to examine dynamics inside a small subset of seeded clouds.

Remote-sensing observations are valuable because radar can describe growth of snow in a cloud in a much more immediate way than snow gauges can, says Bart Geerts, an atmospheric scientist at the University of Wyoming who was part of WWMPP. <sup>90</sup> "Detailed remote-sensing measurements of cloud dynamics are cheaper and more doable than randomized statistical experiments that measure increases in snow on the ground," Geerts says.

21

As used in line 8 "practice" most nearly means

- A) procedure.
- B) profession.
- C) background.
- D) rehearsal.

22

The main purpose of the third paragraph of Passage 1 (lines 18-25) is to

- A) suggest that the extent of a problem has been exaggerated.
- B) gauge the success of an approach to an issue.
- C) detail the solution to a scientific puzzle.
- D) describe a methodology that led to a new understanding.

23

It can reasonably be inferred from Passage 1 that an important reason for the conclusions reached by Alpert and his colleagues was the presence of

- A) conditions that could reasonably account for an apparent increase in rainfall.
- B) the ongoing scarcity of rainfall in different and seemingly unrelated areas of the world.
- C) data available to allow comparison of rainfall in Israel with rainfall in other countries.
- D) a generally accepted account of cloud seeding over the past fifty years.

24

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

- A) Lines 1-6 ("In many . . . clouds")
- B) Lines 18-22 ("During . . . Israel")
- C) Lines 26-28 ("By comparing . . . Alpert")
- D) Lines 32-37 ("Most . . . regions")

25

Which choice best supports the idea that the conclusions of the WWMPP cannot be regarded with complete confidence?

- A) Lines 44-47 ("Called . . . industry")
- B) Lines 56-58 ("Earlier . . . zone")
- C) Lines 75-79 ("But this . . . significant")
- D) Lines 91-94 ("Detailed . . . says")

26

Which choice best represents the different meanings of "run" as used in line 46 and line 68, respectively?

- A) Supervised; complete
- B) Evaded; extend
- C) Conducted; continue
- D) Carried; travel

27

The fifth paragraph of Passage 2 (lines 82-85) serves primarily to

- A) highlight an advanced technique that improved the study.
- B) compare the effectiveness of older and newer approaches.
- C) explore the methods used to justify the cloud seeding.
- D) suggest that some key information may have been compromised.



28

Which choice best describes the relationship between the two passages?

- A) Each passage explored an experiment addressing a certain problem, and these experiments have similar weaknesses.
- B) Each passage describes a research study about the same practice, but these studies yield different conclusions.
- C) Passage 1 provides a general discussion of an ongoing scientific puzzle considered more specifically in Passage 2.
- D) Passage 1 explains the significance of a research finding that Passage 2 argues has only a limited practical application.

29

Which choice best reflects the designs of the studies explored in Passage 1 and Passage 2, respectively?

- A) The researchers in Passage 1 compared seeded and unseeded clouds, whereas the researchers in Passage 2 only seeded clouds.
- B) The researchers in Passage 1 considered a variety of environments, whereas the researchers in Passage 2 focused on a single country.
- C) The researchers in Passage 1 utilized readily available equipment, whereas the researchers in Passage 2 relied on cutting-edge technology.
- D) The researchers in Passage 1 analyzed a set of existing data, whereas the researchers in Passage 2 conducted new experiments.

30

Compared to the way in which the author of Passage 1 presents Alpert's study, the author of passage 2 presents the WWMPP as being

- A) less definitive in its approach.
- B) less flexible in its approach.
- C) more relevant in its approach.
- D) more abstract in its approach.

**Questions 31-41 are based on the following passage and supplementary material.**

This passage is adapted from Jonah Berger, *Contagious: Why Things Catch On*. ©2013 by Social Dynamics Group, LLC.

Although geography clearly matters in voting—the East Coast leans Democratic while the South skews Republican—few people would think that the exact venue in which they vote matters.

5 But it does.

Political scientists usually assume that voting is based on rational and stable preferences: people possess core beliefs and weigh costs and benefits when deciding how to vote. If we care about the environment, we vote for candidates who promise to protect natural resources. If we're concerned about health care, we support initiatives to make it more affordable and available to greater numbers of people. In this calculating, cognitive model of voting behavior, the particular kind of building people happen to cast their ballot in shouldn't affect behavior.

But we weren't so sure. Most people in the United States are assigned to vote at a particular polling location. Polling locations are typically public buildings—firehouses, courthouses, or schools—but can also be churches, private office buildings, or other venues.

Different locations contain different triggers. Churches are filled with religious imagery, which might remind people of church doctrine. Schools are filled with lockers, desks, and chalkboards, which might remind people of children or early educational experiences. And once these thoughts are triggered, they might change behavior. Could voting in a school lead people to support educational funding?

To test this idea, Marc Meredith, Christian Wheeler, and I acquired data from each polling place in Arizona's 2000 general election. We used the name and address of each polling location to determine if it was a church, a school, or some other type of building. Forty percent of people were assigned to vote in churches, 26 percent in schools, 10 percent in community centers, and the rest in a mix of apartment buildings, golf courses, or even RV parks.

40 Then we examined whether people voted differently at different types of polling places. In particular, we focused on a ballot initiative that proposed raising the sales tax from 5.0 percent to 5.6

percent to support public schools. This initiative had  
 45 been hotly debated, with good arguments on both sides.  
 Most people support education, but few people enjoy  
 paying more taxes. It was a tough decision.

If where people voted didn't matter, then the percent  
 supporting the initiative should be the same at schools  
 50 and other polling locations.

But it wasn't. More than ten thousand more people  
 voted in favor of the school funding initiative when the  
 polling place was a school. Polling locations had a  
 dramatic impact on voting behavior.

55 And the initiative passed.

This difference persisted even after we controlled for  
 things like regional differences in political preferences  
 and demographics. We even compared two similar  
 groups of voters to double-check our findings: people  
 60 who lived near schools and were assigned to vote at one  
 versus people who lived near schools but were assigned  
 to vote at a different type of polling place (such as a  
 firehouse). A significantly higher percentage of the  
 people who voted in schools were in favor of increasing  
 65 funding for schools. The fact that they were in a school  
 when they voted triggered more school-friendly  
 behavior.

A ten-thousand-vote difference might not seem like  
 much. But it was more than enough to shift a close  
 70 election. In the 2000 presidential election the difference  
 between George Bush and Al Gore came down to less  
 than 1000 votes. If 1000 votes is enough to shift an  
 election, 10,000 certainly could. Triggers matter.

Increased Percentage Likelihood of Supporting School-Funding Initiative  
 When Voting in a School

	(A) Increased percentage likelihood for all voters	(B) Increased percentage likelihood for voters living within 0.2 miles of a school	(C) Increased percentage likelihood for voters living within 0.4 miles of a school
Initial Results	0.845	0.583	0.556
Results after controlling for demographics	0.788	0.560	0.529

Adapted from Jonah Berger, Marc Meredith, and S. Christian Wheeler, "Contextual Priming: Where  
 People Vote Affects How They Vote." ©2008 by The National Academy of Sciences of the USA.

31

Which statement best expresses the main idea of  
 the passage?

- A) the outcomes of elections can often be attributed to geographic variations in voters' values.
- B) Politicians exploit the triggering effects of voting venues to better their chances in elections.
- C) Voters' attitudes toward education funding are affected by the proximity of voters' homes to schools.
- D) Voting decisions can be influenced by the surroundings in which voters cast their ballots.

32

As used in line 3, "exact" most nearly means

- A) particular.
- B) accurate.
- C) identical.
- D) proper.

33

The passage suggests that most experts who hold  
 the traditional view of voting behavior would say  
 that the school-funding initiative in the 2000  
 Arizona general election passed because the  
 majority of voters

- A) believed that the initiative accorded with their reasoned views.
- B) cast ballots in venues with triggers that encouraged them to favor the initiative.
- C) were exposed primarily to arguments supporting the initiative.
- D) voted for the initiative due to geographic factors.

34

Which choice best illustrates the view referred to in the answer to the previous question?

- A) Lines 1-4 ("Although . . . matters")
- B) Lines 11-13 ("If we care . . . people")
- C) Lines 25-30 ("Schools . . . funding")
- D) Lines 46-47 ("Most . . . decision")

35

In the passage, the author most directly characterizes himself and his research team as

- A) displeased with certain political efforts to manipulate how voters behave.
- B) dissatisfied with the lack of general agreement on how voters think and act.
- C) unconvinced by certain assumptions about how voters make decisions.
- D) alarmed by the strength of their findings regarding how easily voters can be influenced.

36

Which choice best supports the idea that many voters felt deeply invested in the outcome of the vote on the school-funding initiative?

- A) Lines 41-44 ("In particular . . . schools")
- B) Lines 44-45 ("This . . . sides")
- C) Lines 48-50 ("If where . . . locations")
- D) Lines 63-65 ("A significantly . . . schools")

37

As used in line 54 "dramatic" most nearly means

- A) theatrical.
- B) abrupt.
- C) striking.
- D) sensational.

38

Which statement best describes the function of the last paragraph in the context of the passage as a whole?

- A) It addresses a potential criticism of the author's argument by providing a context in which that criticism should be understood.
- B) It suggests that the author's findings may shed light on phenomena in fields other than political science.
- C) It concedes the existence of a significant exception to a trend identified by the author.
- D) It summarizes the argument that the author sought to overturn with his research.

39

Which statement best identifies a weakness in the author's claim in the last sentence?

- A) The author restates the claim that triggers matter but does so without having offered examples of triggers in the passage.
- B) The author characterizes his claim about triggers as innovative, whereas the passage as a whole suggests that many scholars offer similar explanations for voter decisions.
- C) The author states that a trigger influenced a particular election but fails to provide evidence for this claim elsewhere in the passage.
- D) The author makes a general claim about the significance of triggers, but the passage provides evidence of only one instance of a trigger affecting voters' actions.

40

The table most clearly indicates that which statement is true of voters who lived within 0.2 miles of a school and voted in a school?

- A) They supported the school-funding initiative at a higher rate than voters who lived within 0.2 miles of a school and did not vote in a school.
- B) They demonstrated no change in likelihood to support the school-funding initiative after researchers had controlled for demographics.
- C) They were more likely to support the school-funding initiative than to support other initiatives in the election.
- D) They accounted for a larger percentage of voters in the election than did any other group of voters.

41

Based on the passage, the data in the last row and columns B and C of the table helped the author and his team to

- A) identify additional examples of the role of triggers in voters' decisions.
- B) rule out alternatives to their explanation of voters' support for the school-funding initiative.
- C) show that the outcomes of multiple elections support their hypothesis about voters' behavior.
- D) explain why proximity to a school affected the decisions of people who did not vote in schools.

**Questions 42-52 are based on the following passage.**

This passage is adapted from Thomas W. Schoener and David A. Spiller, "Trophic Cascades on Islands." ©2010 by Island Press

In the 1970s, one of us visited more than 500 Bahamian islands to survey distributions of vertebrates, with special emphasis on lizards and birds. A key objective was to determine the threshold island area on which vertebrate populations could just survive. We were astonished to find lizards, particularly *Anolis sagrei*, on some tiny islands, a discovery that multiplied by at least two orders of magnitude the list of Bahamian islands surmised or known to have resident populations of vertebrates. We realized we had to check many quite small islands to determine such thresholds, and in the course of that endeavor we came upon a large number of islands without lizards. This led to a second, even more exciting discovery: Such islands sometimes had extraordinarily high densities of spiders, the omnipresent webbing giving them the appearance of the proverbial grandmother's attic.

In 1981, we had to investigate this phenomenon systematically for the many small islands in the central Bahamas near the relatively large island of Staniel Cay, a major stopover in our earlier survey. Our first study found that spiders were about an order of magnitude denser on no-lizard than lizard islands (adjusted for the positive and negative correlations with area and distance from large landmasses, respectively). A second observational study in 1982 examined numbers of spider species, finding that no-lizard islands had 1.5-2 times the number of species as had lizard islands (again adjusted for area and distance, and for the maximum height attained by the vegetation on the island, which correlated positively with number of spider species). This result was quite different from Paine's (1966) famous one in the rocky intertidal, in which diversity increased with increasing predation, and it presaged other such results for terrestrial arthropods in our system and in others also.

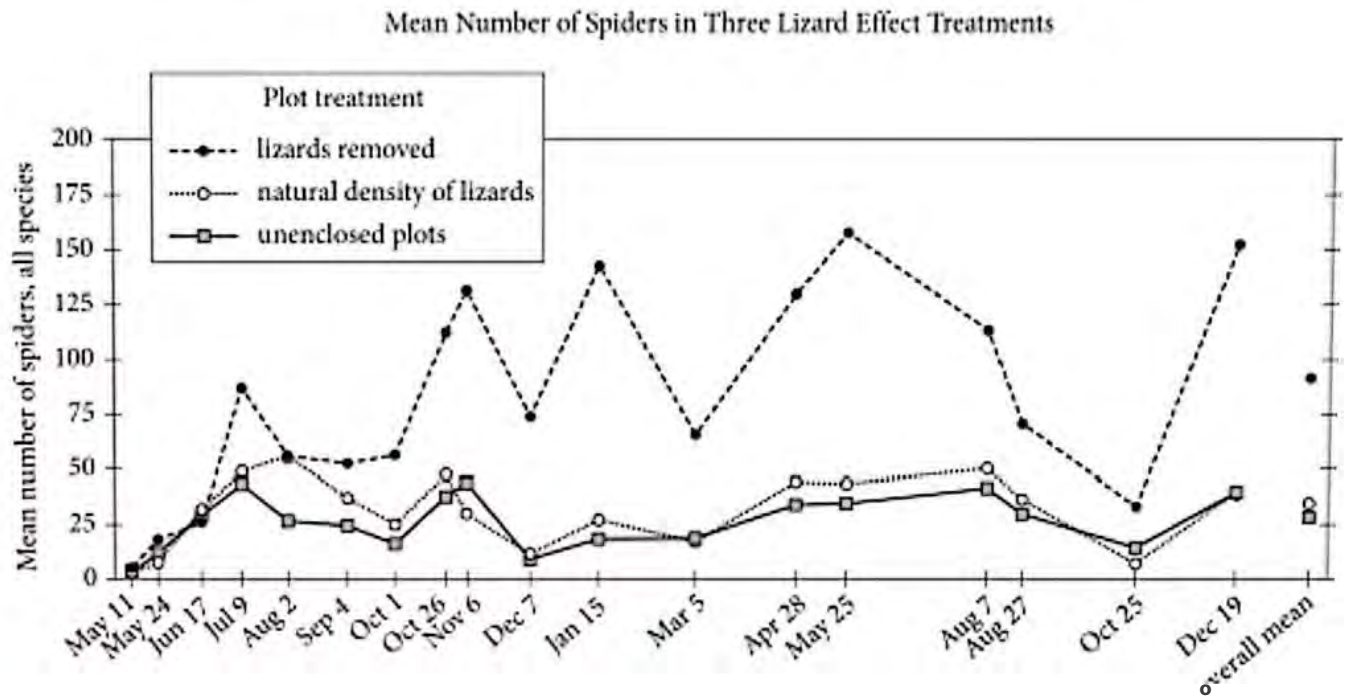
Such comparative data pointed to a strong negative effect of lizards on spiders, but as is true of all comparative studies, the observations did not suffice to eliminate alternative hypotheses about why

islands with and without lizards might differ. A more reliable investigation would be experimental, and toward that end we staked out nine approximately 83-square-meter plots on Staniel Cay in 1985. Three of the plots were unenclosed, and the others had wood-framed fences made of hardware cloth topped with smooth plastic to impede lizard locomotion in and out. Three of the enclosed plots were randomly chosen to maintain lizards at natural densities, whereas the other three had lizards removed. Thus we had three treatments: The two types of enclosed plots tested the lizard effect, and the unenclosed plots were a cage control, to be compared with the enclosed lizard plots. The 18-month experiment showed that lizard removal enclosures had spider densities three times higher than those control enclosures and the unenclosed (also having lizard) plots. Numbers of spider species were higher without lizards as well, in parallel to the comparative studies. Numbers and biomasses of insects caught in the sticky traps were also higher in lizard removal enclosures; therefore, an increase in spiders did not completely compensate for the absence of lizards. There was some effect of the enclosures: Sticky traps in the enclosed plots caught about 20 percent fewer arthropod individuals than those in open plots.

What was the mechanism of the (now firmly established) lizard effect on spiders? The obvious one is predation. However, a second is competition for food: Spiders consume prey large in relation to their own size, so lizards and spiders might overlap in prey size well beyond their relative body sizes alone.



Figure 1



Adapted from David A. Spiller and Thomas W. Schoener, "An Experimental Study of the Effect of Lizards on Web-Spider Communities." ©2010 by the Ecological Society of America

Figure 2

Percent Composition of Anolis Lizard Diets and Adult Female *M. datona* Spider Diets in Lizard Effect Experiments

Prey (by taxonomic order)	<i>M. datona</i> spiders (% of diet)	Anolis lizards (% of diet)
Diptera	18.7	10.1
Homoptera	5.3	30.0
Hymenoptera	18.7	19.8
Coleoptera	53.3	16.9
Araneae	1.3	10.6
Lepidoptera	1.3	1.9
Orthoptera	0.0	4.8
Hemiptera	1.3	1.0
Other	0.1	4.9

Adapted from David A. Spiller and Thomas W. Schoener, "Lizards Reduce Food Consumption by Spiders: Mechanisms and Consequences." ©1990 by Springer-Verlag.



42

As used in line 11, "check" most likely means

- A) counter.
- B) stop.
- C) mark.
- D) inspect.

43

The parenthetical statements in lines 25-27 and lines 30-33 primarily serve to

- A) concede that the observed correlation between spider and lizard populations was weaker than researchers expected.
- B) describe additional variables that the researchers took into consideration while investigating causes of spider population variances.
- C) dismiss a possible objection to assumptions the researchers made while recording observations about spider populations.
- D) offer an explanation for the unusual nature of the spider population data that the researchers obtained.

44

It can reasonably be inferred from the passage that the observational studies of the early 1980s were significant in part because they

- A) showed that certain island ecosystems were more diverse than the researchers previously thought.
- B) incorporated a new method for studying the effect of land area on species population data.
- C) were inconsistent with the findings of an earlier investigation into a similar relationship.
- D) confirmed a positive correlation researchers had long suspected but had not demonstrated.

45

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

- A) Lines 19-22 ("In 1981 . . . survey")
- B) Lines 23-27 ("Our first . . . respectively")
- C) Lines 27-33 ("A second . . . species")
- D) Lines 34-38 ("This . . . also")

46

Based on the passage, the primary advantage the experimental study had over the observational studies was that it could

- A) answer a further research question about the effects of human-made structures on spider and lizard interactions.
- B) control for factors that might have influenced the results of the researchers' observational studies.
- C) isolate lizards and spiders from other species to prevent interactions among them from interfering with results.
- D) provide a better understanding of diverse ecosystem compositions among individual islands than the observational study could.

47

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

- A) Lines 39-46 ("Such . . . 1985")
- B) Lines 46-50 ("Three . . . out")
- C) Lines 50-52 ("Three . . . removed")
- D) Lines 52-56 ("Thus . . . plots")

48

As used in line 51, "maintain" most likely means

- A) keep.
- B) promote.
- C) defend.
- D) declare.

49

Which of the following findings, if true, would best support the explanation presented in lines 71-74 ("However . . . alone")?

- A) The total insect biomass consumed by spiders was reduced in lizard enclosures and unenclosed plots compared with the biomass consumed by spiders in lizard removal enclosures.
- B) The survival rate of spiders was significantly higher in lizard removal enclosures than in lizard enclosures and unenclosed plots.
- C) Fewer spider webs were found closer to the ground where lizards might have easier access to them in unenclosed plots and lizard enclosures than in lizard removal enclosures.
- D) Insects consumed by spiders in unenclosed plots were significantly larger, on average, than were insects in lizard enclosures and lizard removal enclosures.

50

According to figure 1, the overall mean population of spiders in plots where lizards were removed was between

- A) 25 and 50
- B) 50 and 75
- C) 75 and 100
- D) 100 and 125

51

The information in figure 1 most strongly suggests that

- A) spiders prey on more insects in the fall than in the spring.
- B) spider populations tend to be larger in spring than in summer.
- C) the number of lizards in a given plot varies over time.
- D) the presence of lizards helps to reduce variability in the number of spiders over time.

52

Which of the following statements does the information in figure 2 best support?

- A) The removal of Lepidoptera species would have a large impact on Anolis lizard diets.
- B) Hemiptera species are much larger than the species *M. datona* spiders typically prey on.
- C) In the experiment, Anolis lizards were not dependent on any single food source.
- D) The researchers studied a larger sample size of Anolis lizard diets than of *M. datona* spider diets.

## 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.

### Instrumental Repairs

Millions of musicians around the world—from school groups to rock bands to professional symphony orchestras—practice, perform, and travel regularly, **1** meaning they must make arrangements for their instruments to travel with them. Guitars need new frets, clarinets need rusty keys cleaned or replaced, and pianos

1

Which choice most effectively sets up the sentence that follows in the paragraph?

- A) NO CHANGE
- B) meaning their instruments undergo considerable wear and tear.
- C) introducing audiences worldwide to a range of musical instruments.
- D) helping keep those who make musical instruments very busy.

need to be tuned. **2** For comprehensive maintenance and **3** potent repairs, musicians need musical instrument technicians, trained professionals with an expert knowledge of both mechanics and music.

2

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

Piano tuning became a profession at the start of the nineteenth century, when the harpsicord was superseded by the modern piano.

Should the writer make this addition here?

- A) Yes, because it introduces historical information about musical instrument technology that is expanded on later in the passage.
- B) Yes, because it develops the example of piano tuning in a way that sets up the discussion of specialties in the next paragraph.
- C) No, because it fails to address the development of the modern guitar and the modern clarinet.
- D) No, because it offers tangential information about piano tuning that interrupts the paragraph's progression of ideas.

3

- A) NO CHANGE
- B) definite
- C) conclusive
- D) significant

Becoming a musical instrument technician requires **4** dedication. It requires dedication to learning the intricacies of instruments. Many technicians are **5** a musician themselves, and some also have professional backgrounds in business, marketing, or engineering; they often attend technical schools or do apprenticeships with experienced technicians. Though technicians generally specialize in one or two instruments, they need to have extensive knowledge of various instrument types and brands, what kinds of routine maintenance need to be done on them, typical problems that occurs, and how to repair damage. If an instrument is not performing to a musician's standards, a technician needs to be able to diagnose the problem and **6** than advise the client and perform repairs. **7** Likewise, a trumpet might not be functioning properly because the valves have become sticky, the

4

Which choice most effectively combines the sentences at the underlined portion?

- A) one particular form of dedication—that is dedication to learning the intricacies of instruments.
- B) dedication to learning the intricacies of instruments.
- C) dedication to instruments' intricacies that can only be learned.
- D) that instruments' intricacies be learned by individuals who have dedicated themselves to that purpose.

5

- A) NO CHANGE
- B) a musician oneself,
- C) musicians themselves,
- D) musicians him or herself,

6

- A) NO CHANGE
- B) than advise
- C) then advise
- D) then advice

7

- A) NO CHANGE
- B) For instance,
- C) In the first place,
- D) Furthermore,

joints have developed air **8** leaks, or the metal parts have been dented.

[1] Musical instrument technicians are needed in a variety of settings. [2] Large instrument manufacturers such as Steinway, for example, **9** hires instrument technicians to work at their factories and retail stores. [3] Some technicians get to work at concert venues and music festivals, setting up instruments and keeping equipment in optimal shape. [4] Tom Weber, a concert technician for forty years, has traveled extensively and maintained guitars for acts such as Van Halen and Reba McEntire, restringing guitars before each show. [5] He has "never had an artist break a string onstage," he says. [6] After obtaining her certification in piano tuning and technology, Michelle Lamm worked as a piano repair intern and then decided to start her own business, Michelle's Melody Fine Piano Tuning and Repair. [7] She travels to homes and businesses fixing pianos; for one job, she even helped refurbish a forty-year-old grand piano. **10**

Though considerable study and practice are necessary to join the field, musical instrument technicians perform a vital service for musicians and their audiences. Live performances, studio sessions, and the careers of individual **11** musicians all rely on instrument technicians to keep equipment in top shape and the music playing on.

8

- A) NO CHANGE
- B) leaks; or,
- C) leaks, or,
- D) leaks—or

9

- A) NO CHANGE
- B) has hired
- C) is hiring
- D) hire

10

The writer wants to add the following sentence to the paragraph.

Other technicians open their own shops to serve their communities.

To make the paragraph most logical, the sentence should be placed

- A) after sentence 1.
- B) after sentence 3.
- C) after sentence 5.
- D) after sentence 7.

11

- A) NO CHANGE
- B) musicians. All
- C) musicians; all
- D) musicians, all of which



Questions 12-22 are based on the following passage.

### Remix, Reuse, Repurpose

Digital technology has expanded opportunities for creative expression, **12** no matter the art form: the spread of software that can be used to cut parts from different songs and paste them together **13** have spurred the creation of a music genre known as remix, or mash-up. Opponents of this art form maintain that remix artists violate copyright law because they borrow material from protected works to the financial **14** detriment of the original artist. However, remixing is a culturally valuable art form that often benefits the artist whose material is used, and its designation as copyright infringement warrants reconsideration.

[1] Gregg Gillis, aka "Girl Talk," has been involved in debates about the legality of remix art for more than a decade. [2] Using only a laptop, Gillis collects samples from songs ranging from rock ballads to hip-hop, cuts them to different lengths (some as short as a single drum beat) and **15** arranging them into a different form. [3] Although his critically acclaimed 2006 album *Night Ripper* consists of hundreds of samples from different artists, Gillis believes his songs are original because **16** they, "recontextualize the source material into a new whole." [4] His music provides new ways of relating to the

12

Which choice best introduces the topic of the passage?

- A) NO CHANGE
- B) enriching artists worldwide:
- C) even among software developers:
- D) especially in music:

13

- A) NO CHANGE
- B) has spurred
- C) are spurring
- D) were spurring

14

- A) NO CHANGE
- B) deterioration
- C) wounding
- D) limitation

15

- A) NO CHANGE
- B) arranges
- C) to arrange
- D) did arrange

16

- A) NO CHANGE
- B) they:
- C) they
- D) they;

old—listeners may revisit a song they had previously dismissed when they find themselves enjoying it mixed with a song they love—so he believes his sampling qualifies as "fair use," a **17** legally permissible borrowing of copyrighted material for a transformative purpose. **18**

For material to qualify as fair use, however, the borrower must not only transform the meaning of the original but also **19** borrow only a small part of it. If using a sample hurts the sale of a copyrighted work, then it does not qualify as fair use. In such cases, the law

17

- A) NO CHANGE
- B) legal and lawful use of
- C) legal acquisition through borrowing
- D) valid means, or acceptable method, in other words, to borrow

18

To improve the cohesion and flow of this paragraph, the writer wants to add the following sentence.

His songs are composed entirely of samples, excerpts taken from one song for use in another.

The sentence would most logically be placed

- A) after sentence 1.
- B) after sentence 2.
- C) after sentence 3.
- D) after sentence 4.

19

Which aspect of fair use most effectively sets up the next sentence in the paragraph?

- A) NO CHANGE
- B) not damage its economic value.
- C) not incorporate its most memorable aspects.
- D) use the work for the purpose of commentary or criticism.

requires the borrower to obtain a license from the copyright owner, a process that legal scholar Lawrence Lessig describes as prohibitively costly and cumbersome for independent artists. Gillis, though, contends that his work does not hurt but rather promotes interest in the source material. A Girl Talk song that features the Notorious B.I.G. and Elton John might send listeners running to hear more from the Brooklyn rapper and the British songsmith.

Although it is important **20** protecting artists by not allowing complete copies of their work to be distributed without permission, remix art is not a mere verbatim copy but a repurposing of source materials that makes **21** it's audience think about how one piece of art fits into the broader cultural landscape. The law should encourage, not inhibit, this creative interaction with culture, especially when the remix **22** is wildly popular.

20

- A) NO CHANGE
- B) in the protection of
- C) to protect
- D) protect

21

- A) NO CHANGE
- B) its
- C) there
- D) they're

22

The writer wants the conclusion to restate an important idea in the passage. Which choice best accomplishes this goal?

- A) NO CHANGE
- B) wins critical acclaim.
- C) improves on the source material.
- D) renews interest in the original.

Questions 23-33 are based on the following passage.

### The Motivation of Reputation

Motivating people to engage in socially beneficial behaviors, such as conserving energy **23** resources—is a challenge. Many assume that the only way to encourage such engagement is through financial rewards or penalties. Harvard economist Erez Yoeli and his colleagues have learned, however, that reputation is a strong incentive for making choices that aid the public **24** good in ways that benefit everyone. Such choices might entail short-term costs, but they carry a potential long-term benefit: if other people see that an individual is willing to sacrifice personal convenience for the sake of the greater good, they might be inclined to sacrifice their own convenience for that individual's benefit someday.

Yoeli's team of researchers **25** theorized about the historical importance of reputation by comparing different sign-up methods for a voluntary program aimed at preventing domestic power failures. For the program, participants **26** okayed the installation of a device in their homes that limited the use of an air-conditioning unit when demand for energy was highest. Researchers **27** place a sign-up sheet in a public place in housing developments and apartment buildings. Some residents were asked to enroll using an anonymous code; others were asked to use their names, which made the choice to join the program observable to neighbors. The

**23**

- A) NO CHANGE
- B) resources
- C) resources,
- D) resources;

**24**

- A) NO CHANGE
- B) good in society.
- C) good for all.
- D) good.

**25**

Which choice best introduces the primary focus of the paragraph?

- A) NO CHANGE
- B) tested the effectiveness of reputation incentives
- C) proposed a new kind of reward system
- D) convinced people to get involved in their neighborhoods

**26**

Which choice best maintains the style of the passage?

- A) NO CHANGE
- B) gave the thumbs up to
- C) permitted
- D) gave the green light to

**27**

- A) NO CHANGE
- B) will place
- C) have placed
- D) placed

researchers found that the observable sign-up strategy was three times more effective **28** than the anonymous one. They also determined that observable sign-up was considerably more effective than offering a \$25 incentive to enroll. Even though people who enrolled in the program believed that they would suffer an inconvenience—less control over home temperature at certain times of the day—**29** but the publicity of the choice to sign up was incentive enough for many to accept the inconvenience because it made others aware that they were doing their part to prevent blackouts.

**30** Since reputation sometimes fails to promote good deeds, the strength of its influence varies based on the likeliness of one's participation being noticed. For example, in Yoeli's study, sign-up rates were affected by the observability of the location where the sheet was placed. In residences **31** where sign-up sheets were posted in high-activity public spaces, like a shared mail area, anonymous enrollment was 4.8 percent and observable enrollment was 11.4 percent, a difference of

28

- A) NO CHANGE
- B) compared with
- C) than that of
- D) as opposed to

29

- A) NO CHANGE
- B) as well as
- C) however,
- D) DELETE the underlined portion

30

Which choice provides the best transition from the previous paragraph to the information that follows?

- A) NO CHANGE
- B) Although reputation can be a powerful motivator,
- C) Reputation is the single most important factor in decisions, and
- D) One cannot account for the power

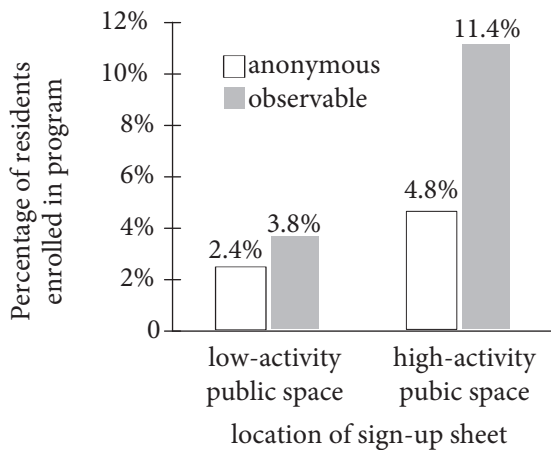
31

Which choice is best supported by information in the graph?

- A) NO CHANGE
- B) where a sign-up sheet was posted,
- C) with the most people living in them,
- D) where the fewest people enrolled in the program,

6.6 percentage points. **32** The more observable the community-minded action, the more likely **33** those are to benefit the individual's reputation. On the other hand, says Yoeli's coauthor David Rand, if an action is not observable, "then there's no problem with not participating."

Anonymous and Observable Methods for Enrolling in Blackout Prevention Program Based on Location of Sign-Up Sheet



Adapted from Erez Yoeli et al., "Powering Up with Indirect Reciprocity in a Large-Scale Field Experiment." ©2013 by Erez Yoeli et al.

32

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

But in those with less active public spaces, anonymous enrollment was 2.4 percent and observable enrollment was 3.8 percent, a difference of only 1.4 percentage points.

Should the writer make this addition here?

- A) Yes, because it uses information from the graph to acknowledge an opposing point of view regarding the issue discussed in the passage.
- B) Yes, because it provides accurate evidence from the graph to support the paragraph's argument.
- C) No, because the data it provides from the graph contradict the information offered in the next sentence.
- D) No, because the data it provides from the graph are irrelevant to the passage's main idea.

33

- A) NO CHANGE
- B) it is
- C) one is
- D) they are



Questions 34-44 are based on the following passage.

### Photosynthesis in the Dark

Although it has been known for **34** centuries that plant's absorb carbon dioxide ( $\text{CO}_2$ ), a gas that animals exhale, it was not until the 1940s that scientists understood how plants use this gas during photosynthesis, the process by which plants convert light energy into chemical energy that they store in the form of sugars. The discovery was made through a series of experiments conducted by the **35** chemists Melvin Calvin and Andrew Benson. Key to their early experiments was a technique called carbon labeling, which allowed Calvin and Benson to determine whether plants need light exposure while they break down  $\text{CO}_2$  to use its carbon atoms to construct sugars. The scientists decided to use a variation of  $\text{CO}_2$  in which the ordinary carbon atoms would be replaced with carbon-14 ( $^{14}\text{C}$ ), a radioactive isotope of carbon that would function as a radiotracer: plants would absorb and metabolize the  $^{14}\text{CO}_2$  as though **36** they are regular  $\text{CO}_2$ , and then the researchers would track the  $^{14}\text{C}$  to determine what the plant had done with it.

**37** One sample was stored in the dark for eight hours; the air in that sample's container had  $\text{CO}_2$ . The

**34**

- A) NO CHANGE
- B) century's that plants
- C) centuries that plants'
- D) centuries that plants

**35**

- A) NO CHANGE
- B) chemists, Melvin Calvin
- C) chemists Melvin Calvin,
- D) chemists: Melvin Calvin

**36**

- A) NO CHANGE
- B) they were
- C) it were
- D) it is

**37**

Which choice most effectively introduces the events recounted in the paragraph?

- A) The decision to use carbon labeling was critical to Calvin and Benson's success.
- B) One advantage of using single-celled algae rather than other kinds of plants was that the algae could be conveniently collected and measured with a pipette.
- C) The question was, did light need to shine on the plants while they were breaking the bonds between the carbon and oxygen atoms in  $\text{CO}_2$ ?
- D) Calvin and Benson began with two samples of living algae.

other sample was exposed to bright light for one hour;

**38** this sample was considered to be "preilluminated."

After removing the air from both containers and placing them in the dark, **39** the samples were exposed to the CO<sub>2</sub> by the researchers. Five minutes later, the algae samples were killed to prevent further metabolic activity, and their molecular contents were examined.

The sample initially stored in the dark container had produced almost no sugars made with the traceable <sup>14</sup>C, indicating that the algae hadn't metabolized the <sup>14</sup>CO<sub>2</sub>.

**40** Finally, the algae had not been able to photosynthesize. But the algae in the other sample, which had been initially exposed to the one hour of light, produced measurable **41** concentrations of radioactive

**38**

Which choice completes the sentence with information most parallel to that provided in the previous sentence?

- A) NO CHANGE
- B) the air in that sample's container had no CO<sub>2</sub>
- C) the researchers used a 150-watt tungsten lamp.
- D) the sample, like the other, consisted of 1 cubic centimeter of algae.

**39**

- A) NO CHANGE
- B) the <sup>14</sup>CO<sub>2</sub> exposure was initiated by the researchers.
- C) the researchers exposed the samples to the <sup>14</sup>CO<sub>2</sub>.
- D) it was time for the researchers to expose the samples to the <sup>14</sup>CO<sub>2</sub>.

**40**

- A) NO CHANGE
- B) However,
- C) Alternately,
- D) In other words,

**41**

- A) NO CHANGE
- B) portions
- C) doses
- D) sums

sugars. **42** In this sample, carbon atoms from the  $^{14}\text{CO}_2$  had been used to construct the frame of the sugar glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ). Oxygen (O) and hydrogen (H) atoms from another molecule were also used. During its  $\text{CO}_2$ -starved exposure to light, the algae had stored the light's **43** energy, and then later using that stored energy to construct sugars in the dark. **44**

Through this experiment, Calvin and Benson were able to conclude that light was not directly responsible for breaking  $\text{CO}_2$ 's bonds. Something else in the plant did that. The chemists spent several years identifying that enzyme (rubisco), and their research helped elucidate the rest of the chemical cycle that results in the generation of glucose during photosynthesis.

42

Which choice best most effectively combines the underlined sentences in a way that makes clear that the carbon atoms are more central to the discussion than are the hydrogen and oxygen atoms?

- A) In this sample, carbon atoms from the  $^{14}\text{CO}_2$  had been used —along with oxygen (O) and hydrogen (H) atoms from another molecule—to construct the frame of the sugar glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ).
- B) Carbon atoms from the  $^{14}\text{CO}_2$  and oxygen (O) and hydrogen (H) atoms from another molecule had been used to construct the frame of the sugar glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) in this sample.
- C) The frame of the sugar glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ ) had been constructed in this sample using not only the carbon atoms from the  $^{14}\text{CO}_2$  but also oxygen (O) and hydrogen (H) atoms from another molecule.
- D) In conjunction with the carbon atoms from the  $^{14}\text{CO}_2$ , this sample had also used oxygen (O) and hydrogen (H) atoms from another molecule to construct the frame of the sugar glucose ( $\text{C}_6\text{H}_{12}\text{O}_6$ )

43

- A) NO CHANGE
- B) energy; then later using
- C) energy, it then later used
- D) energy. It then later used

44

The writer wants to interpret the results of the experiment and set up the statement of the researchers' conclusion provided at the beginning of the next paragraph. Which choice most effectively accomplishes this goal?

- A) Calvin and Benson published their findings as part of a series of papers called "The Path of Carbon in Photosynthesis."
- B) Although the experiment yielded some answers, questions remained.
- C) This experiment in conjunction with many others advanced the researchers' understanding of photosynthesis.
- D) Light did not have to shine on the plant while these chemical reactions took place.

## 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, 20 QUESTIONS

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

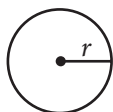
## DIRECTIONS

For questions 1-15, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 16-20, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 16 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

## NOTES

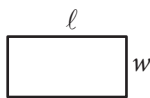
- The use of a calculator **is not permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- Unless otherwise indicated,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

## REFERENCE

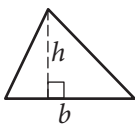


$$A = \pi r^2$$

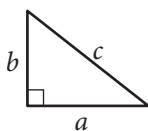
$$C = 2\pi r$$



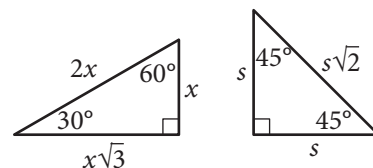
$$A = \ell w$$



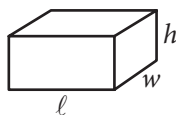
$$A = \frac{1}{2}bh$$



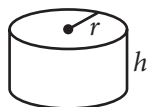
$$c^2 = a^2 + b^2$$



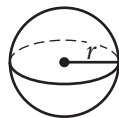
Special Right Triangles



$$V = \ell wh$$



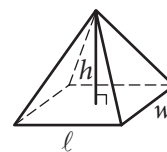
$$V = \pi r^2 h$$



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



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



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

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

Tobias rented a kayak from a sports equipment store. For the rental, the store charged \$60 per day plus \$25 for delivery. If Tobias was charged a total of \$325, for how many days did he rent the kayak?

- A) 3
- B) 5
- C) 7
- D) 11

2

$$(2xy^2 + 3x - 4) + (3xy^2 - 8x + 4)$$

Which of the following is equivalent to the expression above?

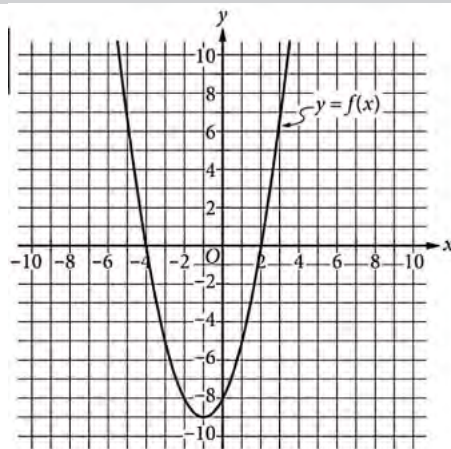
- A)  $5xy^2 - 5x$
- B)  $5xy^2 + 5x$
- C)  $5xy^2 - 5x - 8$
- D)  $5xy^2 + 5x + 8$

3

The function  $f$  is defined by  $f(x) = 3^x$ . What is the value of  $f(2)$ ?

- A) 5
- B) 6
- C) 8
- D) 9

4



The graph of  $f$  is shown. According to the graph, what is the value of  $f(0)$ ?

- A) -9
- B) -8
- C) -4
- D) 2



5

$$h(x) = -4(x-1) + 2$$

The function  $h$  is defined above. For what value of  $x$  is  $h(x) = -2$ ?

- A) -2
- B) -1
- C) 1
- D) 2

6

$$C = \frac{5}{9}(R - 491.67)$$

The equation above expresses the temperature  $C$ , in degrees Celsius, in terms of the temperature  $R$ , in degrees Rankine. Which of the following expresses the temperature in degrees Rankine in terms of the temperature in degrees Celsius?

- A)  $R = \frac{9}{5}C + 491.67$
- B)  $R = \frac{9}{5}C - 491.67$
- C)  $R = \frac{5}{9}C + 491.67$
- D)  $R = \frac{5}{9}C - 491.67$

7

A geographer found that the land area of Aruba is 75 square miles and the land area of Bermuda is 19 square miles. Based on these data, the geographer used the equation  $75x + 19y = T$  to estimate the total number of residents,  $T$ , of the two islands. Which is the best interpretation of  $x$  in this context?

- A) The total number of residents of Aruba
- B) The number of square miles of Aruba
- C) The total number of residents of both islands
- D) The population density, in residents per square mile, of Aruba.



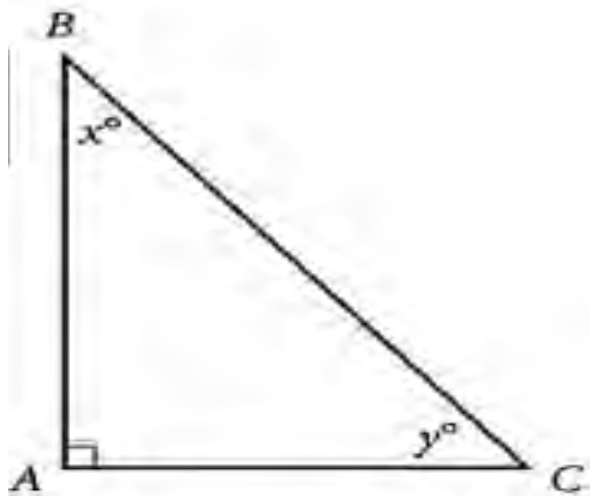
8

$$x^2 - 12x + 35 = 0$$

What is the sum of the solutions to the given equation?

- A) -35
- B) -12
- C) 12
- D) 35

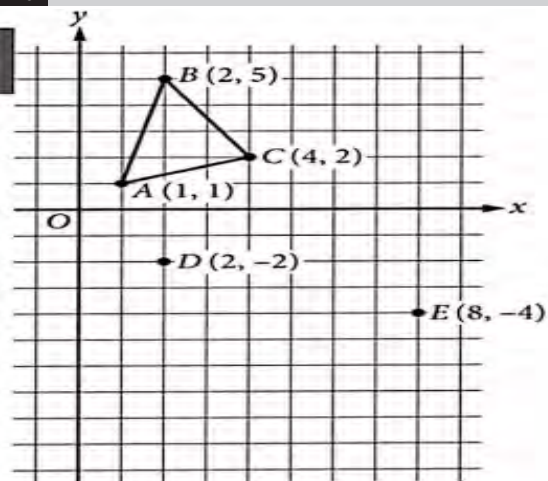
9



In the right triangle  $ABC$  above,  $\sin(x^\circ) = \frac{5}{8}$ . What is the value of  $\cos(y^\circ)$ ?

- A)  $\frac{25}{64}$
- B)  $\frac{39}{64}$
- C)  $\frac{5}{8}$
- D)  $\frac{\sqrt{39}}{8}$

10



In the  $xy$ -plane above, if point  $F$  (not shown) is placed so that triangle  $ABC$  is similar to triangle  $DFE$ , which of the following could be the coordinates of the point  $F$ ?

- A) (3, -6)
- B) (4, -10)
- C) (6, -7)
- D) (6, -1)

11

$$\begin{aligned} y &= x + 3 \\ 2x - y &= 0 \end{aligned}$$

Which of the following is the value of  $y$  in the solution  $(x, y)$  to the system of equations above?

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



12

$$A(t) = 50(2)^t$$

The function  $A(t)$  models the number of liters of a fluid in a tank after  $t$  hours. Which of the following models the number of liters of the fluid in the tank after  $m$  minutes?

- A)  $A(m) = 50(2)^{\frac{m}{60}}$
- B)  $A(m) = 50(2)^{60m}$
- C)  $A(m) = 50(2)^{\frac{60}{m}}$
- D)  $A(m) = 50(2)^m$

13

$$3x+8=kx+8$$

In the given equation,  $k$  is a constant. If the equation has exactly one solution, which of the following could NOT be the value of  $k$ ?

- A) 0
- B) 1
- C) 3
- D) 8

14

How many solutions does the equation  $x(x-4)=(x-1)(x+1)$  have?

- A) Zero
- B) One
- C) Two
- D) More than two

15

$$2^{2/n}(n\sqrt{3})$$


If  $n$  is a positive integer, which of the following is the equivalent to the expression above?

- A)  $3^{\frac{1}{n}}$
- B)  $18^{\frac{1}{n}}$
- C)  $\sqrt[n]{6}$
- D)  $\sqrt[n]{12}$



**DIRECTIONS**

For questions 16–20, 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  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.

Grid result.

← Fraction line

← Decimal point

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

	7	/	1	2
	●	/		
●	●	●	●	
	0	0	0	
①	①	●	①	
②	②	②	●	
③	③	③	③	
④	④	④	④	
⑤	⑤	⑤	⑤	
⑥	⑥	⑥	⑥	
●	⑦	⑦	⑦	
⑧	⑧	⑧	⑧	
⑨	⑨	⑨	⑨	

Answer: 2.5

	2	.	5
	/	/	
●	●	●	
	0	0	0
①	①	①	①
②	●	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	●
⑥	⑥	⑥	⑥
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

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

	2	/	3
	/	●	
●	●	●	
	0	0	0
①	①	①	①
②	●	②	②
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
	/	/	
●	●	●	
	0	0	0
①	①	①	①
②	②	②	②
③	③	③	③
④	④	④	④
⑤	⑤	⑤	⑤
⑥	●	●	●
⑦	⑦	⑦	⑦
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

.	6	6	7
	/	/	
●	●	●	
	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
⑦	⑦	⑦	●
⑧	⑧	⑧	⑧
⑨	⑨	⑨	⑨

Answer: 201 – either position is correct

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

	2	0	1
	/	/	
●	●	●	
	●	0	0
①	①	●	①
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.



16

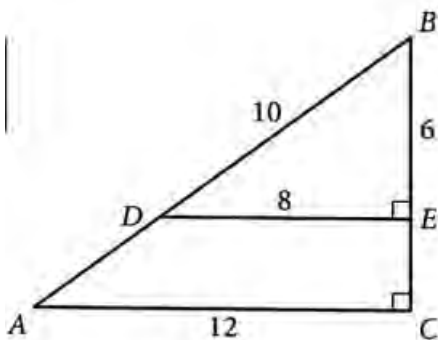
x	2	2	2
y	0	1	2

Several values of  $x$  and their corresponding values of  $y$  are shown in the table. A linear equation that represents the relationship shown in the table is  $x=k$ , where  $k$  is a constant. What is the value of  $k$ ?

17

If  $12x+6=4x+8$ , what is the value of  $x$ ?

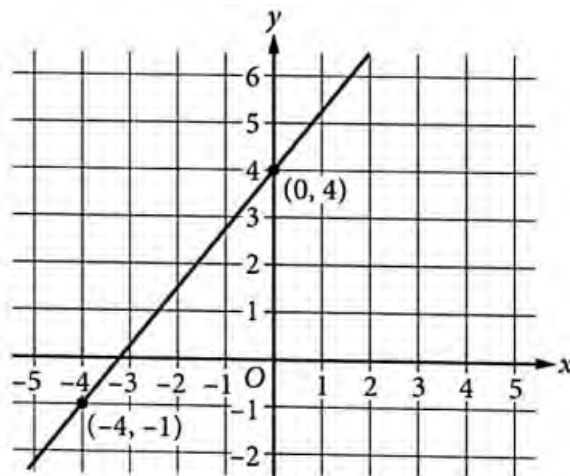
18



In the figure, triangles  $ABC$  and  $DBE$  are right triangles. What is  $\cos B$ ?

19

A system of two linear equations has no solutions. The graph of one of the equations in the system is shown in the  $xy$ -plane.



The second equation in the system is  $ax - y = 1$ , where  $a$  is a constant. What is the value of  $a$ ?

20

x	0	1	2
$f(x)$	9	12	16

For the exponential function  $f$ , the table shows some values of  $x$  and the corresponding values of  $f(x)$ . The function can be written in the form  $f(x)=pr^x$ , where  $p$  and  $r$  are constants. What is the value of  $r$ ?

# 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

55 MINUTES, 38 QUESTIONS

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

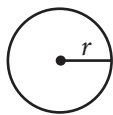
## DIRECTIONS

For questions 1-30, solve each problem, choose the best answer from the choices provided, and fill in the corresponding circle on your answer sheet. For questions 31-38, solve the problem and enter your answer in the grid on the answer sheet. Please refer to the directions before question 31 on how to enter your answers in the grid. You may use any available space in your test booklet for scratch work.

## NOTES

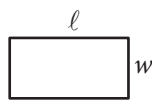
- The use of a calculator **is permitted**.
- All variables and expressions used represent real numbers unless otherwise indicated.
- Figures provided in this test are drawn to scale unless otherwise indicated.
- All figures lie in a plane unless otherwise indicated.
- Unless otherwise indicated, the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

## REFERENCE

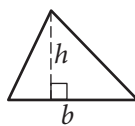


$$A = \pi r^2$$

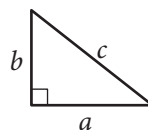
$$C = 2\pi r$$



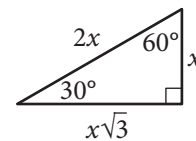
$$A = \ell w$$



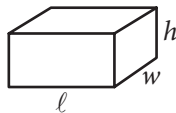
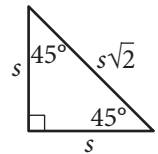
$$A = \frac{1}{2}bh$$



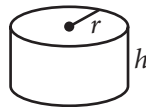
$$c^2 = a^2 + b^2$$



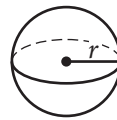
Special Right Triangles



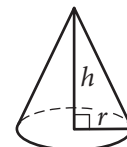
$$V = \ell wh$$



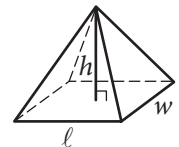
$$V = \pi r^2 h$$



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



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



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

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

$$2n = -22$$

What value of  $n$  satisfies the given equation?

- A) -44
- B) -11
- C) 11
- D) 44

2

The ratio of trumpets to violins in a particular music classroom is 1 to 3. If there are 9 trumpets in the classroom, how many violins are there?

- A) 2
- B) 3
- C) 9
- D) 27

Questions 3 and 4 refer to the following information.

Albedos of Various Earth Surfaces

Surface	Minimum albedo	Maximum Albedo
Meadow	0.11	0.19
Crop	0.16	0.24
Dry soil	0.22	0.34
Desert	0.26	0.29
Snow	0.41	0.84

An albedo is the amount of light reflected from a surface divided by the amount of light falling on the surface. The amount is typically measured in watts per square meter. The table shows the minimum and maximum albedos for different types of surfaces on Earth.

3

For which of the following surfaces is the range of albedos the greatest?

- A) Meadow
- B) Crop
- C) Desert
- D) Snow

4

In a desert region, the amount of sunlight falling on a surface with an area of one square meter is 1,000 watts. Which of the following could be the amount of sunlight, in watts, reflected from this one-square-meter surface?

- A) 275
- B) 525
- C) 725
- D) 1,275



5

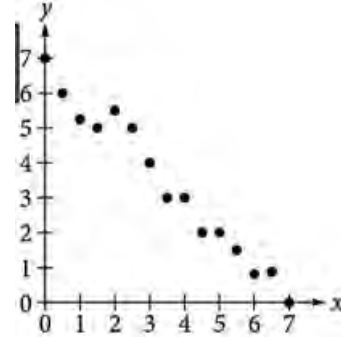
The table shows the distribution by breed and sex of dogs that received a vaccine from a veterinarian during the month of July.

Breed	Sex	
	Male	Female
Alaskan malamute	6	2
American foxhound	4	8

If a male dog that received a vaccine during the month of July is selected at random, what is the probability that the dog breed is Alaskan malamute?

- A) 0.30
- B) 0.40
- C) 0.60
- D) 0.75

6



Of the following, which is the most appropriate linear model for the given data?

- A)  $y = -7 + x$
- B)  $y = -7 - x$
- C)  $y = 7 + x$
- D)  $y = 7 - x$



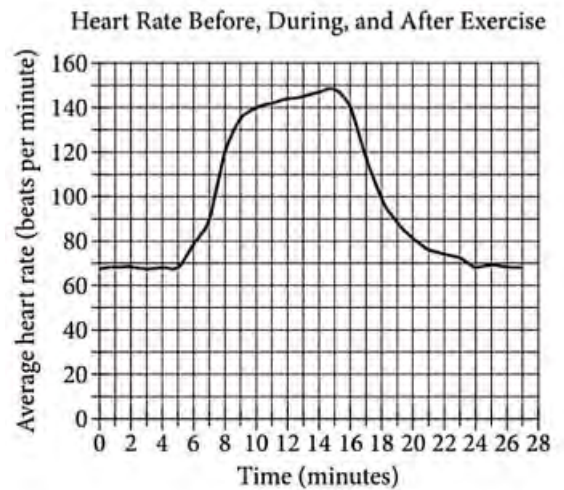
7

The area of a square is 36 square inches. What is the length, in inches, of a side of the square?

- A) 3
- B) 6
- C) 9
- D) 18

8

The graph shows the average heart rate for 15 people before, during, and after a period of strenuous exercise. The horizontal axis shows time, in minutes, and the vertical axis shows average heart rate, in beats per minute. The exercise period began at 5 minutes and ended at 15 minutes.



Approximately how many minutes did it take after the exercise period ended for the average heart rate to first return to the average heart rate before the exercise period began?

- A) 9
- B) 15
- C) 24
- D) 27



9

Markela opens a bank account that earns interest at a rate of 2% compounded annually. She puts \$200 in the account when she opens it and does not make any more deposits into or withdrawals from the account for 2 years. If the amount of money in the account after 2 years is given by the expression  $200(1.02)^2$ , which of the following expressions gives the amount of money in the account after 1 year?

- A)  $100(1.02)$
- B)  $200(1.02)$
- C)  $100(1.02)^2$
- D)  $200(1.01)^2$

10

If  $3x=8y$  and both  $x$  and  $y$  are positive, which of the following equals  $40y$ ?

- A)  $\frac{3}{5}x$
- B)  $\frac{5}{3}x$
- C)  $5x$
- D)  $15x$

Questions 11-13 refer to the following information.

$$T(n)=80+n$$

$$S(n)=1,280+30n$$

The given equations model the number of teachers and students in a high school from 2002 through 2017. In the equations,  $n$  is the number of years after 2002, where  $n$  is a whole number less than or equal to 15. The predicted number of teachers and students are  $T(n)$  and  $S(n)$ , respectively.

11

Based on the model, how many teachers are predicted to be in the high school in 2017?

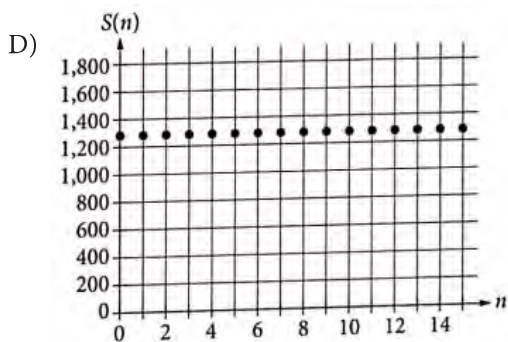
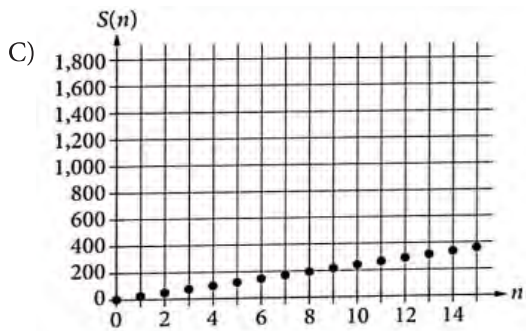
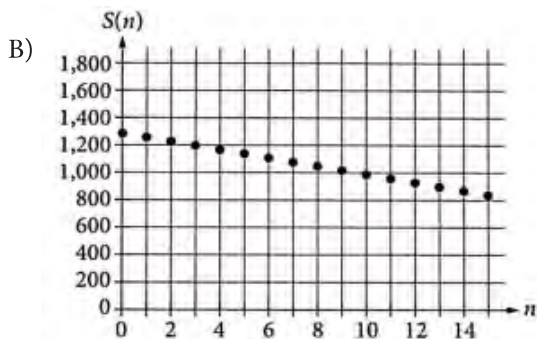
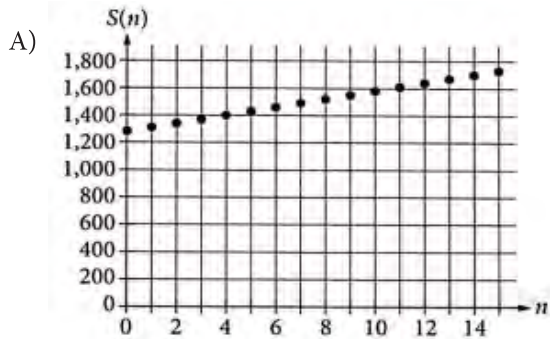
- A) 80
- B) 90
- C) 95
- D) 100





12

Which of the following is the graph of function  $S$ ?



13

Based on the model, what is the first year in which the predicted number of teachers will be greater than 90?

- A) 2014  
 B) 2013  
 C) 2012  
 D) 2011

14

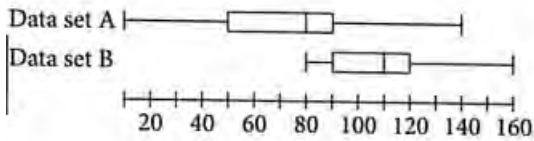
Type	Mass(kg)	Length(cm)
Leatherblack sea	650	210
Loggerhead sea	545	213
Green sea	500	140
Galápagos giant	400	187
Aldabra giant	360	150
Alligator snapping	183	81
Hawksbill sea	127	100
Black sea	126	100
Flatback sea	84	95

The table above shows the masses, in kilograms (kg), and lengths, in centimeters (cm), of the largest known specimens of the 9 most massive types of turtles and tortoises. The mean mass of the 9 turtles and tortoises is approximately 331kg. The mass of the Aldabra giant tortoise is closest to the mean mass. Which of the following is true about the length of the Aldabra giant tortoise in relation to the median length of the 9 turtles and tortoises?

- A) It is the median length.  
 B) It is 29 cm longer than the median length.  
 C) It is 10 cm longer than the median length.  
 D) It is 10 cm shorter than the median length.



15



Each of the box plots shown summarizes a data set. Data set A has a range of 130, and data set B has a range of 80. If the two data sets are combined into one data set, what is the range of the combined data set?

- A) 50
- B) 105
- C) 150
- D) 210

16

At the beginning of a study, the number of bacteria in a population is 150,000. The number of bacteria doubles every hour for a limited period of time. For this period of time, which equation models the number of bacteria  $y$  in this population after  $x$  hours?

- A)  $y = 150,000^{2x}$
- B)  $y = 150,000(2)^x$
- C)  $y = x^2 + 150,000$
- D)  $y = 2x^2 + 150,000$

17

$$y = (x+3)(x-7)$$

$$y = x - 7$$

If  $(x, y)$  is a solution to the given system of equations, which of the following could be the value of  $x$ ?

- A) -7
- B) -3
- C) 3
- D) 7



18

The speed of a lightning bolt is approximately 320 million feet per second. What is the speed, in yards per minute? (1 yard = 3 feet)

- A) 160 million
- B) 960 million
- C) 6,400 million
- D) 19,200 million

19

$$S(t) = 158t^2 - 771t + 10,268$$

The number of students enrolled in a certain university  $t$  years after 1969 can be modeled by the function  $S$  above, for  $0 \leq t \leq 33$ . The constant term 10,268 in the function is an estimate for which of the following?

- A) The number of students enrolled in 1969
- B) The number of students enrolled in 2002
- C) The number of additional students enrolled each year.
- D) The maximum number of students enrolled in a single year from 1969 through 2002



20

A company found that the average customer rating of a certain product can be used to estimate the total income from that product, according to the equation  $y = 44x + 500$ , where  $y$  is the income, in dollars, and  $x$  is the average customer rating. Which of the following best describes the slope of the graph of the equation in the  $xy$ -plane?

- A) For every increase of 44 in the average customer rating, the estimated increase in income is \$500.
- B) For every increase of 1 in the average customer rating, the estimated increase in income is \$544.
- C) For every increase of 1 in the average customer rating, the estimated increase in income is \$500.
- D) For every increase of 1 in the average customer rating, the estimated increase in income is \$44.

21

$$2x - y = 3$$

$$4x - y = 3$$

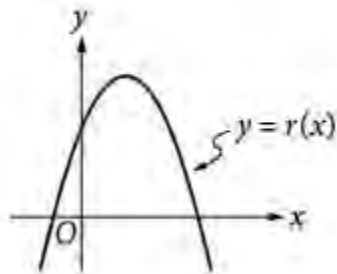
How many solutions does the system of equations have?

- A) Zero
- B) Exactly one
- C) Exactly two
- D) Infinitely many



22

The graph of  $y=r(x)$  is shown in the  $xy$ -plane.



If  $a$ ,  $b$ , and  $c$  are positive constants, which of the following could define the function  $r$ ?

- A)  $r(x) = -a(x-b)^2+c$
- B)  $r(x) = -a(x+b)^2+c$
- C)  $r(x) = a(x-b)^2+c$
- D)  $r(x) = a(x+b)^2+c$

23

$$\frac{x^2-2}{x-\sqrt{2}}$$

Which of the following is equivalent to the expression above for  $x \neq \sqrt{2}$ ?

- A)  $x-1$
- B)  $x+1$
- C)  $x-\sqrt{2}$
- D)  $x+\sqrt{2}$



24

Which of the following represents the positive number  $r$  increased by 5%?

- A)  $0.05r$
- B)  $0.95r$
- C)  $1.05r$
- D)  $5r$

25

Value	Frequency
1	1
2	4
3	2
4	3
5	7

What is the median of the data set summarized in the frequency table?

- A) 2
- B) 3
- C) 4
- D) 5

26

An airplane uses approximately 5 gallons of fuel per mile flown. If the plane has 60,000 gallons of fuel at the beginning of a trip and flies at an average speed of 550 miles per hour, which of the following functions estimates the amount of remaining fuel  $A(t)$ , in gallons,  $t$  hours after the trip began?

- A)  $A(t) = 60,000 - 110t$
- B)  $A(t) = 60,000 - 550t$
- C)  $A(t) = \frac{60,000 - 550t}{5}$
- D)  $A(t) = 60,000 - 2,750t$

27

$$3x^2 + bx + 5 = 0$$

For the quadratic equation shown,  $b$  is a constant. If the equation has no real solutions, which of the following must be true?

- A)  $b^2 < 60$
- B)  $b^2 > 60$
- C)  $b < 0$
- D)  $b > 0$

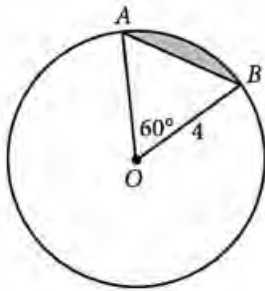


28

Lines  $q$  and  $r$  in the  $xy$ -plane are perpendicular and intersect at the origin. If line  $r$  passes through  $(1, k)$ , what is the equation of line  $q$ ?

- A)  $y = -kx$   
 B)  $y = \frac{-x}{k}$   
 C)  $y = \frac{1-x}{k}$   
 D)  $y = x - \frac{1}{k}$

29



In the figure above, the circle has center  $O$ . What is the area of the shaded region?

- A)  $\frac{8\pi}{3}$   
 B)  $\frac{1}{3}(12\sqrt{3}-4\pi)$   
 C)  $\frac{1}{3}(8\pi-8\sqrt{3})$   
 D)  $\frac{1}{3}(8\pi-12\sqrt{3})$

30

A survey asked a class of 30 students how many siblings they have. The number of students who have one sibling is 3 times the number of students,  $n$ , who have two or more siblings. If 6 students have no siblings, which of the following equations represents this situation?

- A)  $\frac{1}{3}n+6=30$   
 B)  $3n+6=30$   
 C)  $4n+6=30$   
 D)  $6n+6=30$




**DIRECTIONS**

For questions 31–38, 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
•	•	•	•

 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: $\frac{7}{12}$			
7	/	1	2
•	•	•	•
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: 2.5			
2	.	5	
•	•	•	•
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

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

2	/	3	
•	•	•	•
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
•	•	•	•
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	7
•	•	•	•
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

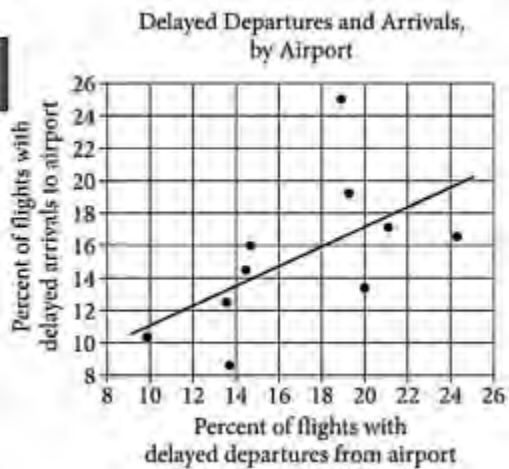
2	0	1	
•	•	•	•
0	0	0	0
①	①	①	①
②	②	②	②
③	③	③	③

2	0	1	
•	•	•	•
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.

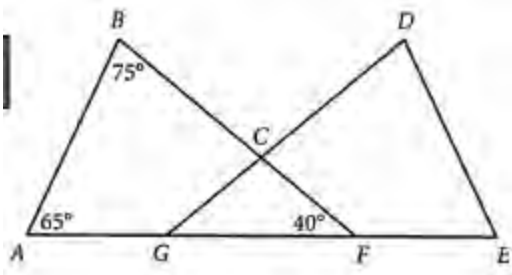


31



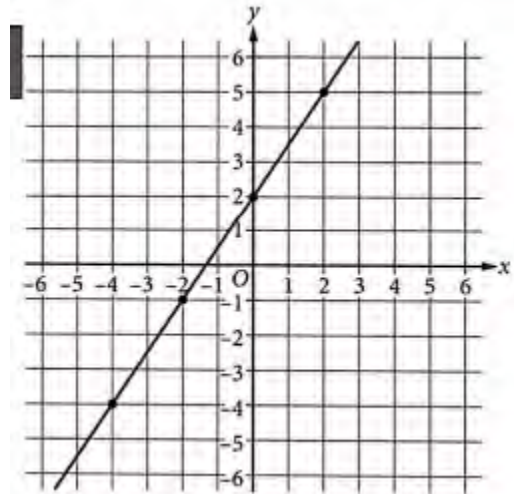
The scatterplot shows the percent of flights with delayed departures and the percent of flights with delayed arrivals, by departing airport, for 10 US airports in a certain one-year period. A line of best fit is also shown. For how many of the 10 airports was the percent of flights with delayed arrivals less than predicted by the line of best fit?

32



The points in the figure shown lie in the same plane. If  $\triangle ABF$  is congruent to  $\triangle EDG$ , where  $\angle A$  corresponds to  $\angle E$  and  $\angle B$  corresponds to  $\angle D$ , what is the measure, in degrees, of  $\angle GCF$ ? (Disregard the degree symbol when gridding your answer.)

33



The graph of the equation  $y=mx+b$ , where  $m$  and  $b$  are constants, is shown in the  $xy$ -plane. What is the value of  $m$ ?

34

Eyespot is a disease in corn that is caused by a fungus. An agricultural researcher investigated whether the presence of eyespot necessitated treatment of a cornfield using fungicide. The table shows the relationship between the presence of eyespot in a cornfield and the need to use fungicide.

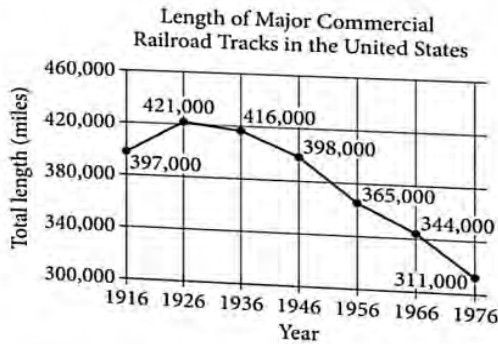
	Fungicide needed	Fungicide not needed	Total
Eyespot observed	30	10	40
Eyespot not observed	15	8	23
Total	45	18	63

According to the table, what fraction of the cornfields where an eyespot was observed needed fungicide?



35

The line graph shows the total length, in miles, of major commercial railroad tracks in the United States from 1916 to 1976



The average rate of change, in miles per year, of the total length of major commercial railroad tracks in the United States from 1916 to 1926 is  $m$ . What is the value of  $m$ ?

36

A painting crew painted a total of 20 houses in July. In August, the number of houses the crew painted was 20 percent more than the number of houses they painted in July. What fraction of the total number of houses the crew painted in July and August was painted in August?

37

A car was listed with a price of \$12,000. The price decreased by  $p\%$  to \$9600. What is the value of  $p$ ?

38

$$\left(\frac{1}{3}t+5\right)+\left(\frac{1}{2}u-4\right)=37$$

$$\left(\frac{1}{3}t+5\right)-\left(\frac{1}{2}u-4\right)=19$$

For the system of equations above, what is the value of the product  $\left(\frac{1}{3}t+5\right)\left(\frac{1}{2}u-4\right)$ ?

# STOP

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

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